P105 3D virtual models for planning percutaneous Cryoablation of small renal masses

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Introduction & Objectives: To evaluate the impact of 3D models for planning of percutaneous renal Cryoablation (Cryo) in terms of number and type of cryoprobes needed to be used and the effectiveness of a 3D-based approach for Cryo.

Materials & Methods: We prospectively enrolled 10 patients with clinical T1a renal mass unfitted for surgical treatment, scheduled for computed tomography (CT)-guided percutaneous Cryo. Before procedure, all patients underwent 3D virtual reconstruction (including tumor, renal parenchyma, arterial and venous branches and urinary collecting system) based on preoperative CT using D2P^{TM} software. Due to pre-treatment procedure's simulation, different gauges and lengths of cryoprobes, route of probe insertion through the renal parenchyma and the predicted volume of the iceball were reconstructed within the 3D model (Figure). The 3D virtual model was used for planning the percutaneous orientation of the probes, the use of specific type of cryoprobe, the number of cryoprobes needed, and for the simulation of the ideal necrosis area generated by the iceball according to the planned type of cryoprobe. The maximum size of the predicted iceballs at 3D model and the maximum size of the ablated area at CT imaging after procedure were compared using the McNeamar test. Persistent disease and local recurrence were defined as residual and new focal enhancement in the ablation area at 3 months and >3 months follow-up imaging, respectively. Complications and residual renal function were evaluated during follow up.

Results: No significant difference was found between the maximum size of the predicted iceballs at 3D model (mean±SD: 45.7±9 mm) and the maximum size of the ablated area at CT performed after procedure (mean±SD: 41.3±8mm; p=0.06); no significant variation of glomerular filtration rate was observed at mean follow-up of 12 months. Renal bleeding was the main postoperative complication occurred in 2 patients (20%): conservative management (Clavien 2) was applied in 1 case and arterial embolization (Clavien 3) was performed in the other one. At 3 months, 1 patient (10%) experienced persistent disease due to incomplete ablation, that was re-treated with further percutaneous Cryo with complete ablation and no post-procedural complications.

Conclusions: The use of 3D virtual reconstruction of renal models may help the planning of percutaneous Cryo to choose the ideal type and number of cryoprobes that should be used to achieve the adequate ablative area.