## Ablation of small renal masses: tips for a successful percutaneous cryoablation

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Kidney tumour ablation is endorsed by professional associations in their Guidelines [1-3] in old patients with comorbidity and elevated surgical risk. The ideal tumour to be treated by ablation is a cT1a, although ablation might be extensive to cT1b when information on a higher chance of residual and recurrent tumour is adequately provided [2].

Currently Cryoablation (CA) and Radiofrequency (RFA) are the two recommended techniques when kidney tumour ablation is envisaged [3]. Preliminary reports on Microwave ablation, HIFU or IRE ablation technologies exists but should be considered as emerging/ developmental techniques with ongoing trials to gain IDEAL level 2 [1,3].

Patient and tumour characteristics will ultimately determine the suitability for ablation. Once this type of treatment is considered selection of the procedural approach follows.

CA was traditionally performed laparoscopically assisted and linked to urologists [4]. RFA was mainly percutaneous reported likely due to the previous experience in other organs ablation acquired by the radiologists. However, small comparative studies showed advantages on adopting the percutaneous approach, when possible, in terms of in hospital stay, reduction of the anaesthetic burden, more rapid recovery and overall decreased costs [3,5,6]. Some reports pointed a reduction of the complication rate when the percutaneous route was used [3,5,6]. Nevertheless, the later remains to be irrefutably proven and hindered by the bias in complication reporting [3]. While the advantage of the laparoscopic route relies in the precise control and displacement of neighbourhood organs as well as and the possibility of haemostatic control, the absence of Gerota distortion to access the tumour in the percutaneous procedure allows for a retroperitoneal tamponade if bleeding. Furthermore, displacement of intestine or ureter can be achieved in a percutaneous procedure by controlled injection of Glucosaline serum [7].

In our setting, Percutaneous ablation was implemented in clinical practice in 2010. Since then, it has been a switch from laparoscopic to percutaneous ablation with only very restrictive indications for laparoscopic assisted approach. The video illustrates a percutaneous CA of a tumour suspect for RCC, from the initial decision-making process [8] that includes patient and tumour characteristics to the procedural performance and finalizing with the post-procedural control and personalized follow-up plan.

1. Patient selection

Clinical characteristics of the patient and morphological characteristics of the tumour are taken into consideration in a patient harbouring a solid, enhancing renal mass suspect for RCC.
Patients are considered for ablation when there is a significant co-morbidity or other medical conditions that might compromise life's quality or expectancy.

Co-morbidity is assessed according to CCI and CACI [8]. As some reports suggest that cardiovascular index (CVI) may a better indicator of life expectancy and likelihood of other cause mortality, CVI is also considered in a research setting since the beginning of 2016 [9].

Surgical risk is assessed by the anaesthetic team according to ASA classification.
Tumour characteristics are assessed by RENAL and Padua anatomical scores including anterior or posterior situation of the tumour and proximity to the intestine or the ureter.
The case and possible options of treatment are discussed in a multidisciplinary team that includes Urologists, Oncologist and Radiologist as well as other disciplines when necessary.
This multidisciplinary team provides a stepwise advise on treatment options that are posteriorly discussed with the patient. A tumour biopsy is recommended previous to treatment decision.
Through full information on advantages and disadvantages of the treatment options as well as rationale for the stepwise advice and risk/complications of the different treatment options are extensively shared and discussed with the patient.

Related to anatomical considerations tumours located in the posterior valve of the kidney are initially considered for percutaneous approach. With evolving experience, the indications extends also to tumours in the anterior valve. Indications for laparoscopic approach include tumours located in the upper anterior pole of the kidney, tumours in contact with the ureter and those anterior tumours in which the radiologist considerers that the intestine cannot be safely displaced. Transpleural approach for upper pole tumours is not envisaged in our setting.

2. Procedural ablation

Previous to initiate the CA, coagulation parameters have to be under control, antibiotic prophylaxis should be administered, as most of the patients are at risk of complications and when CT guided approach is planned it is important to consider pre-hydration in order to minimize contrast toxicity.

Percutaneous ablation takes place in the radiological suite and usually under CT guided. Ultrasound guided ablation is performed in seldom cases when the tumour is visible and easily accessible by this guidance. In those cases with contraindication for the use of Jodium contrast at least for CA, MRI visible cryoprobes are available.

Usually the procedure is performed under general anaesthesia although there are reports in the literature supporting the feasibility of the procedure under sedation (Ref).

After checking that the pressure of Helium (to thaw) and Argon ( to freeze) are adequate to sustain the complete procedure the patient is placed in the CT table in a suitable position for percutaneous access of the tumour. Usually the position is  either lateral or prone depending on the location and relation of the tumour with neighbourhood anatomy.

CT without and with contrast are performed to localize the lesion. If necessary displacement manoeuvres usually by injection of 5% Glucosaline are done, until a safety distance of at least 1.5 cm is established between the margin of the tumour and the intestine or ureter. A delayed CT phase is necessary to avoid puncturing directly the collecting system.

At his point the necessary Cryoprobes are prepared and checked to avoid malfunctioning (rare). The number of Cryoprobes depends on the size of the tumour and the type of Cryoprobes used as the length and wideness of the individual Ice ball varies for the different Cryoprobes types.