Percutaneous ultrasound-guided Radiofrequency Ablation (RFA) of pancreatic ductal adenocarcinoma

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Aims and objectives

The primary objective of this study was to evaluate the safety and feasibility of ultrasound-guided radiofrequency ablation (RFA) of unresectable, non metastatic pancreatic ductal adenocarcinomas located in the pancreatic body. Secondary objective were to determine the response to treatment and the cytolitic and cytoreductive effects after the procedure.

Methods and materials

Between June 2013 and December 2014, 19 patients with biopsy-proven unresectable locally advanced non metastatic pancreatic adenocarcinoma of the pancreatic body have been included in the study.

1 patient has been excluded during follow-up period because the re-analysis of the CT scan obtained before the procedure showed peritoneal spread of the disease, being this case a mistake in the inclusion procedure.

The present study therefore included 18 patients (10 males; 8 females; mean age 62.4 years; range 47-78 years) with 18 pancreatic lesions located in the pancreatic body-tail. Mean size of the lesions was 48.1 mm (range 25-86 mm).

Patients deemed eligible for the procedure underwent pretreatment workup including baseline complete blood count, liver and renal function tests, coagulation profile, serum level of Ca19.9 tumor marker evaluation and anesthesia evaluation.

Before the procedure, a conventional abdominal US examination was performed (Sequoia 512 US scanner, Acuson, Mountain View, CA, USA), in order to assess the reachability of the lesion.

The procedure was performed under deep sedation in the interventional radiology suite with constant monitoring of patient’s blood oxygen saturation and cardiac activity.

Under US guidance the pancreatic lesion is identified and the RFA needle (VARI Tip (VCT) needle connected to a Mygen RF generator and cooled by the Cool-Wet Tip pump cooling system, RF Medical Co, Ltd., Seoul, Korea) is positioned taking care to avoid the peri-pancreatic anatomical structures. The electrode is consequently opened and its conductive portion placed in the context of the noplastic tissue.

The ablation parameters for the procedure are set according to the lesion dimension, the proximity of delicate anatomical structures and the tissue impedance recorded by the needle tip.
The whole procedure were constantly real-time monitored by means of US.

During the procedure the tumor gradually became hyperechoic owing to the gas produced inside the treated lesion. This sign could be used to confirm the radiofrequency effect.

At the end of the procedure the needle was carefully removed.

The post-treatment evaluation assessed the volume of the resultant hyperechoic treated area. The presence of incomplete necrosis with a significant hypoechoic neoplastic remnant could be treated again.

Post-procedural abdominal dynamic CT studies and serum level of Ca19.9 tumor marker evaluation were performed 24 hours and 1 month after the procedure.

If no complications appeared, patient was discharged from hospital.

**Images for this section:**

![Vari Tip (VCT) needle used for the ablative procedure.](image)

**Fig. 1:** Vari Tip (VCT) needle used for the ablative procedure.
Results

Procedure and technical success

In 16 cases the procedure has been completed in a single session. In 2 patients the procedure has been repeated twice over a time interval. In a single session, 4 out of 16 (25%) patients underwent a single ablative procedure, 11 (68.7%) patients underwent two passages and 1 (6.3%) patient underwent three passages in the same session.

The mean radiofrequency application time for every single passage was 3 min 13 sec (range 30 sec - 10 min).

In 2 out of 20 procedures the conductive portion of the needle had a 0.5 cm length; in 17 cases the conductive portion of the needle had a 1 cm length and in 1 case the conductive portion of the needle had a 1.5 cm length.

A 20W power has been applied in only 1 passage, a 30W power in 25 passages, a 40W power in 34 passages and a 50W power in 2 passages.

After every procedure, a hyperechoic gas-filled area was visible in the context of the lesion, and the needle tip recorded a decrease of the tissue impedance around the needle tip itself, except in one case.

A CT examination was performed 24 hours after the ablative procedure for every patient. The mean size of the necrotic portion was 32 mm (range 15 - 65 mm). The mean extension of the ablated area was 70% of the whole lesion extension.

Technical success of the procedure, defined as the achievement of an ablated area as wide as or wider than 50% of the total lesion extension, has been obtained in 93% of cases.

Complications

None of the patients developed post-procedural complications demonstrated at peri-procedural US monitoring or at post-procedural CT, clinical or laboratory evaluation.

Laboratory follow-up

A correlation between serum level of Ca19.9 tumor marker and the procedure effect has been possible in 11 patients.

Mean Ca19.9 serum levels one day before, one day after and one month after the procedure were respectively 308.7 U/ml (range 16.6 - 1941.0 U/ml), 425.8 U/ml (range 17.9 - 2522.0 U/ml) and 141.9 U/ml (range 7.0 - 367.0 U/ml). In 8 cases Ca19.9 serum
levels increased after the procedure. In 2 patients the Ca19.9 serum level one month after the procedure was not available. Among the 9 remaining patients, 4 (44.5%) presented decreased Ca19.9 values one month after the procedure, 3 (33.3%) presented stable Ca19.9 values one month after the procedure and 2 (22.2%) presented increased Ca19.9 values one month after the procedure.

**Imaging follow-up**

An abdominal CT scan one month after the procedure has been performed in 18 out of 20 procedures. In 8 out of 18 (44.4%) patients it showed an increase in lesion size while in 10 out of 18 (55.6%) patients the lesion size was stable.

**Clinical follow-up**

Mean clinical follow-up time was 4 months (range 2 - 10 months).

**Images for this section:**

![Image](image_url)

**Fig. 2:** Pre-procedural feasibility study performed by means of conventional US
Fig. 3: Pre-procedural CT study
**Fig. 4:** Intra-procedural US monitoring showing the development of necrosis
Fig. 5: Post-procedural CT study showing the treated hypodense necrotic area
Conclusion

This study demonstrated the technical feasibility of US-guided radiofrequency ablation of locally advanced non-resectable non-metastatic pancreatic adenocarcinoma.

The RFA procedure seems to be helpful in the local control of the disease both from the radiological and the clinical-laboratory point of view.

This technique has been demonstrated to be well tolerated since no complication has been developed in the present series.

More data about the improvement of the quality of life and the increase of the survival rate are needed.

Personal information

References


