Successful treatment of pancreatic cancer liver metastasis using Immunostimulating Interstitial Laser Thermotherapy (imILT).

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Introduction

Immunostimulating Interstitial Laser Thermotherapy (imILT) is a thermal ablation technique inducing a precisely controllable local tumor tissue destruction as well as a suggested immunological response systemically. Using a temperature feedback system the temperature in the treatment area is tightly regulated.

Method and instrument

A Laser unit (TRANBERG 41.ag Mobile Laser unit, Clinical Laserthermia Systems AB) emitting light at 1064 nm was used. The light was delivered with a radial fiber (OD 1.55 mm), which was inserted in the tissue through a introducer (OD 2.1 mm). A Multi-Point sensor measured the temperatures at four different points around the lesion. We used a treatment protocol with power 5W, treatment temperature 40°C and duration of 30 minutes. For safety reasons, the maximum time of heating of the liver tissue is 5 min. If the tissue temperature does not reach 40°C within 5 min the settings are modified as: 1) if the tissue temperature is above 43°C, the treatment will continue according to protocol at this temperature and; 2) if the temperature is below 43°C, the treatment will continue at 3W for an additional 25 minutes.

Case history

A 53 year-old man had presented two years before with a cancer of the pancreatic head with three liver metastases (stage IV). On the first regimen of chemotherapy, there was a reduction in the sizes (partial response) of the primary tumour as well as the liver metastases. Due to intolerable toxicity, the patient was switched to a second regimen. At the time of intervention, the patient was maintained on a third line of chemotherapy with gemcitabine and protein-bound Paclitaxel. PET-CT immediately before the intervention showed a hypermetabolic focus around the biliary stent, but no clearly visible tumour. There were three liver metastases which were small in size (segments VI, V/VI and segment V/peri-gallbladder area). Only the small metastasis (diam 19 mm) in segment VI was metabolically active on PET-CT, and this metastasis was therefore chosen for laser thermotherapy in May 2015.

Treatment

With the patient under general anaesthesia in the gantry, sequential CT scans were used to place the laser fiber in the lesion, and the tip of temperature probe was placed approx. 10 mm away. Treatment lasted for 30 min, and a maximum temperature of 44-45°C was used. After repositioning, of the fiber, a second, overlapping lesion was created to ensure complete ablation of the metastasis. At the end of the session, a track ablation was done to minimize the risk of seeding cancer cells.

Immunological aspects of imILT

In pre-clinical studies, imILT was capable of inducing abscoal effects. A proposed mechanism is action that (1) local treatment induces (2) release of antigens and (3) recruitment of inflammatory cells. Antigens are (4) presented to lymphocytes which in turn (5) mediates tumor destruction both at the treated site and distant metastases.

Treatment outcome

The figure above shows the temperature regulation during the treatment.

A post-treatment CT-scan showed an elongated ablation cavity, which encompassed the metastatic site (black arrow, figure below). Following treatment, the patient had some local pain and a slight rise (38°C) in temperature, but no other discomfort was noted. He was discharged on day 3. White arrow shows a metallic covered stent in the common bile duct.

Safety evaluation

The patient had transient, local pain and a slight rise (38°C) in temperature during the first days, but no complications were noted during the first three months. The laser fibers used remained intact after treatment and the laser instrument was able to regulate the temperature as intended.

Conclusions

- Minimal-invasive ablation of a pancreatic cancer liver metastasis with imILT was possible with minor discomfort to the patient.
- The instrument performed according to protocol in the clinical setting.