

## WELCOME to Dr. R. Delfrate and Dr. M. Bricchi that started to use Echolaser at the private clinic "Casa di Cura Figlie di San Camillo" in Cremona for the treatment of benign thyroid nodules

The first procedure was performed on Tuesday April 8<sup>th</sup> 2014 on two patients with benign thyroid nodule, without risk and complication

### About them

#### Roberto Delfrate

Is specialized in venous diagnostics and haemodynamic surgery. He graduated with a Degree in Medicine at the University of Parma, and later specialized in general surgery and vascular surgery. Since 2007 he has been in charge of the operative surgery unit at the private clinic Casa di Cura Figlie di San Camillo in Cremona.



#### Massimo Bricchi

Is graduated with a Degree in Medicine at the University of Brescia. Since 2007 he has been working on a team that deals with venous haemodynamic diagnostics and surgery at the operative unit of general surgery of the private clinic Casa di Cura Figlie di San Camillo in Cremona. The Echolaser was used to precisely position the fibres to deliver the energy in situ, far away from

sensitive structures, and control the thermal effect caused by the laser. All was performed precisely and safely.

### About the two Patients

#### 1. Woman 54 years old

Single autonomously functioning thyroid nodules, (Plummer's disease). 12 ml volume nodule. Treatment with only local skin anaesthesia. No complications occurs after the laser treatment. No need to take analgesics. No functional limitation. Steroid therapy for a week to control oedema. No therapy with antithyroid agents. Follow-up in progress to control the volume of the nodule and thyroid function.

#### 2. Woman 42 years old

Double elastofibroma dorsi. One on the left (8x9 cm) and one on the right (8x5) in the subscapular region. Diagnosis performed with MNR and FnB. Symptomatic on the left side: pain in shoulder movements. Laser treatment on the left side under skin local anaesthesia. No complication occurs after the laser treatment. No need to take analgesics. No functional limitation in shoulder movements. Follow-up in progress to control the volume of the tumor.

### Dott. Delfrate point of view:

Why, as a surgeon, have you taken into consideration a non-surgical treatment of thyroid nodules?

First of all I think of myself as a professional interpreting patients' desire for a suitable solution of their problem with the maximum safety and less invasiveness as possible. Therefore I have always considered every alternative to surgery, if less invasive, feasible, and with equal therapeutic effectiveness, an option to be proposed to people who come to me requesting a solution to their problem.

What are your impressions after having performed the first procedure on a thyroid nodule?

During the years I have matured a considerable experience in the use of ecocolor-doppler and I have perceived the potentialities of this treatment modality for different pathologies, including some types of thyroid nodules, with great advantages for all the three subjects of the classic quality triangle: patients, operators, health companies-administrators.

See You  
There:

6-10 September  
Santiago de  
Compostela, Spain  
ETA 2014  
38<sup>th</sup> Annual  
Meeting  
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The technique of laser ablation guided by ultrasound is revolutionary in many aspects. From the clinical point of view, it can handle without risk of complications and with minimal contraindications some mostly solid abnormal structures.

Every each illumination, a single laser fiber is capable of necrotic cells in a predictable and adjustable volume between 0.7 and 2.6 cm<sup>3</sup>, which opens access to critical sites located in pathologies. In brief I see great benefits in terms of efficacy, security and rapidity of treatment, obviously by following a correct diagnostic pathway.

**After the first experience what prospects (also in terms of number of patients eligible for the mini invasive procedure based on your experience as surgeon) and what applications do you foresee in your future activity?**

It is the opinion of many surgeons that the excess of surgical indications for the thyroid pathology is a problem. Laser thermal ablations represent for me as a surgeon an exceptional tool for differentiating treatments according to effectiveness, security and minor invasiveness criteria. Certainly the road ahead is still long and the scientific and cultural

conditions to spread this method have to be created by a constant and responsible work.

Therefore at the moment it is difficult to correctly predict the volume of activity, that I personally believe will be substantial in the total volume of surgical interventions.

**What benefits do you think your hospital will have by introducing laser therapies?**

The scientific community is continuously evaluating new diagnostic techniques and treatment of benign and malignant pathologies and I think it is fundamental that every hospital supports the efforts of its physicians in the research of quality and excellence because this is the only way to keep efficacy in the healthcare sector.

In particular, significant efforts are being made in the areas of medical imaging and innovative technologies that provide an alternative to conventional treatments: in this context Echolaser represents a concrete answer.

**Dr. Roberto Delfrate**  
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European Thyroid Association  
**38th Annual Meeting**  
Santiago de Compostela, Spain | 6-10 September 2014

## The ETA Annual Meeting offers a unique opportunity for Echolaser Club to meet and increase internal discussion about **minimally invasive treatment of benign thyroid nodules**



In line with the experiences of the past editions, we are confident that the ETA 2014 programme will be set to the elevated scientific expectations.

Moreover, it is our intention to encourage participants to have a very close cooperation with the experts during the Echolaser Club Meetings in order to bring home an unforgettable practical experience.

Esaote will highlight the uniqueness of Esaote Technology (High Frequency Ultrasound, Biopsy Needle enhancement, Virtual Biopsy, Virtual Navigator-Elastosonography, Contrast media Imaging and Laser Therapy) to open wider horizon in Endocrinology.

**Looking forward to see you in Santiago de Compostela.**

**Anouk Pluijmeekers**  
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# My Tips & Tricks for treatment of large hepatocellular carcinoma: a clinical case

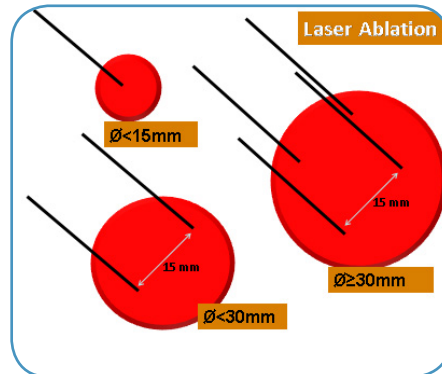
## Liver Laser ablation with the multifiber technique

### Positioning of fibers

Our strategy for positioning multiple fibres into liver tumours is a modification of the original technique proposed by Pacella. In the seminal technique, one to four 300 µm bare optical fibers are introduced through 21-gauge needles that are positioned one at a time through a single skin entry port under ultrasound guidance. The fibers are spaced 1.5-1.8 cm apart throughout the target lesion. However, when the pull-back technique is used for treating large lesions, the distance between the laser fibers is not maintained and the ablative zone may be obviously smaller than that expected. In fact, when needles are introduced through a single skin entry port, the tips of the needles during the pull-back manoeuvre get closer between them reducing the ablative effect. A multicenter study reported that complete ablation rate dropped from 85.1% for nodules ≤ 2.0 cm to 60.4% for nodules ranging in size from 3.1 to 4.0 cm, reflecting both interoperator variability and the limits of the pull-back technique based on single skin entry point. To overcome these limitations, we used a novel guidance system to make precise placement of multiple needles into tumours in a parallel fashion. This expedient allows that a fixed distance between needle tips is maintained also during the pull-back technique in order to maximize the ablative effect.

Using a bare tip, almost spherical lesions with a maximum diameter of 12-16 mm can be produced. The lesion size can be increased by the simultaneous use of multiple fibers in an array around the tumor. In vitro studies have shown that simultaneous treatment with four fibers at 2.0 cm separation produces lesions that are 11 times bigger than those produced with a single fiber, creating a lesion cylinder 4.0 cm in diameter and 3 cm in height. It is crucial that all the needles are positioned before starting treatment. This avoids the problem of repositioning single fibers and the difficulties associated with treatment-induced imaging artifacts. According to the nodule volume and shape, up to eight needles are used.

In cases of nodules up to 2.0 cm in diameter, two fibers delivering 2400-3600 J in 4-6 min are employed. For nodules up to 3.0 cm, four fibers arranged in a square configuration with a side length of 1.5-1.8 cm and a single illumination for 6 min (delivering 4800-7200 J) are used. In cases of nodules >3.0 cm, four to eight needles and the pull-back technique are employed. We have obtained an ablation area with a maximum diameter of 9 cm (volume 100-200 ml) using an energy delivery up to 60,000 joules. The technique is resulted safe mainly due to the main laser characteristic that is its precision. In fact, the ablated area and the increase in tissutal temperature remain restricted to the zones near the fiber tips.



## Laser ablation for the treatment of large hepatocellular carcinoma: a clinical case

According to the internationally endorsed guidelines, thermal ablation is the mainstay of treatment in patients with unresectable hepatocellular carcinoma (HCC) classifiable in stage A according to the Barcelona Clinic Liver Cancer (BCLC) staging. Among ablative techniques radiofrequency ablation is the most widely used and is supported by major vendors. Laser ablation (LA) is a less explored procedure, but retrospective studies have shown that LA may be safe and effective to achieve the complete ablation of small HCC nodules. In a previous study we have shown that this technique was also effective in patients with large tumors, classifiable in stage B according to BCLC.



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We report the case of an obese 84 years old female affected by cirrhosis HCV-related, diabetes, and a 6 cm mass localized in the VI liver segment with esophytic growth. The liver function was well preserved (Child-Pugh class A). She underwent to a dynamic contrast-enhanced computed tomography (CT) that showed a few enhancing mass (volume 68 ml) in arterial phase, without washout in the portal phase, and hypodensity in the late phase (Figures 1-3).

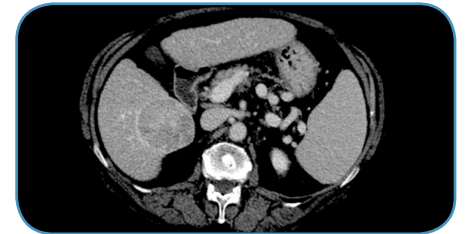


Fig. 1: CT image in arterial phase of HCC before treatment

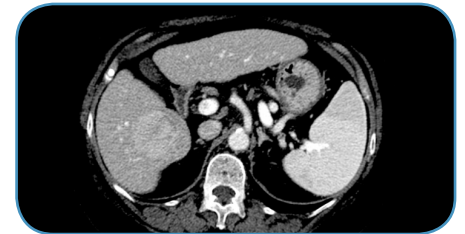


Fig. 2: CT image in portal phase of HCC before



Fig. 3: CT image in late phase of HCC before treatment

A liver biopsy was performed showing a medium differentiated HCC. Surgical resection was excluded due to the high operative risk and transarterial chemoembolization could not be performed due to atherosclerotic changes of hepatic artery. During conscious sedation (with midazolam, fentanyl, and propofol) LA with the multifiber technique was performed. A commercially available system (Echolaser, Elesta Srl, Florence, Italy) composed of an US device and a laser unit was used. The laser source was a semi-conductor diode with a wavelength of 1064 nm. Eight 21-gauge



needles were inserted in the tumor in a parallel fashion and with tips arranged in a square configuration with a side-length of 1.5-1.8 cm (Figures 5-6).

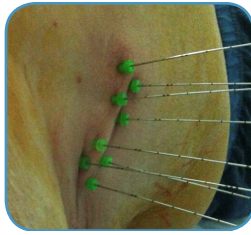
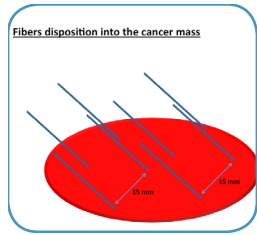


Fig. 5: Needles arrangement Fig. 6: Needles arrangement on the patient's skin

Needles were inserted using a guidance device for use with a US transducer that was made up of a reusable frame for housing the transducer and a disposable snap-on needle guide (Figure 7).



Figure 7: snap-on needle guide

This device is commercially available (Elasta Srl, Florence, Italy). The needle guide had separate channels so that two needles could be inserted in a parallel position and at a prefixed distance. On the US machine screen, dotted lines displayed needle paths with an angle of 15°C or 30°C. The first needle was introduced through the channel of the guide nearer to the ultrasound probe. The second needle was inserted in a separate parallel channel positioned at a distance of 1.5-1.8cm from the first. After positioning the needles, the guide was released from the probe and the procedure was repeated to place another pair of needles. All needles were positioned before starting LA so that any gas caused by the treatment would not prevent the correct positioning of the needles. After removal of the needle stylets, four flat tip bare optical fiber measuring 300 µm in diameter were alternatively inserted in all the needles. According to the previous experiences of Pacella, four illuminations were performed using the pull-back technique releasing overall 29,000 joules and the treatment lasted 24 minutes. The procedure was well tolerated and the patient was discharged from the hospital 24 hours after the procedure. The only side-effects were mild pain and self-limiting fever lasting for 7 days. CT scan performed after 4 weeks showed complete necrosis of the tumor: the volume of necrosis was 87 ml (Figures 8-9).

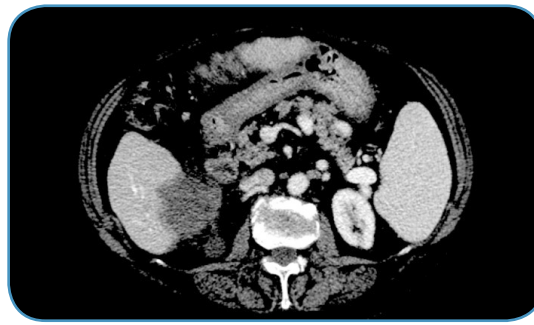


Figure 8 and 9: CT images in arterial phase showing complete necrosis of HCC with esophageic growth, adjacent to the right colon and kidney

In Fig 10-11 and Eleven the US images of the Lesion before and after the treatment



Figure 10: US image during LA procedure

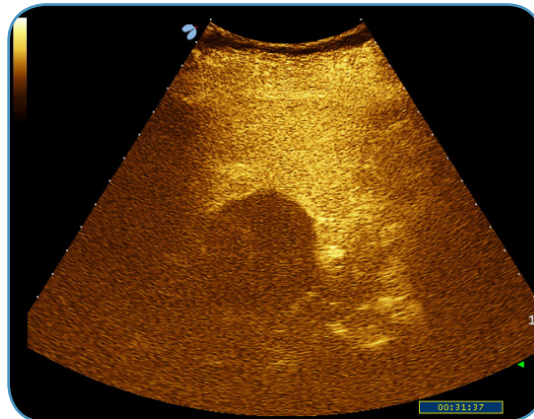


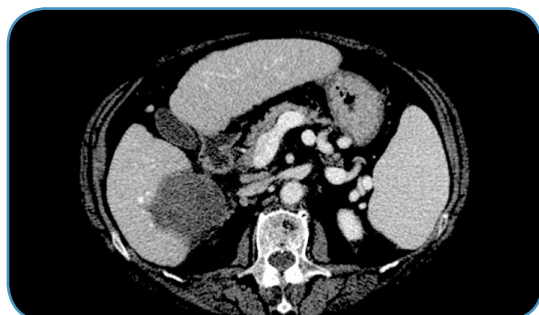
Figure 11: CEUS image after the treatment

In conclusion, LA resulted safe and effective in treating a large HCC mass in high-risk location.

The main interesting characteristics of LA technique is the high efficiency of laser light in destroying the tissue (duration of the treatment: 24 minutes) and the achievement of a large volume of necrosis in a single session. The accurate positioning of fibers in a square configuration is useful in maximizing the ablative effect. We are now conducting a phase II randomized study to evaluate the efficacy of LA in treating large HCC (size between 4 and 8 cm).

In this study the patients are assigned in a random fashion to receive a four weeks sorafenib treatment before LA or to be treated only with LA.

According to our experience, we believe that LA is a good technique to achieve large volume of necrosis in patients affected by liver cancer and it is an evaluable procedure for the treatment of large (> 5 cm) liver masses.



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