

Laser-induced Interstitial Thermal Therapy for Liver Metastases

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Summary and conclusions

SBU's appraisal of the evidence

Laser-induced thermotherapy is a non-surgical method for treating tumors in solid organs. The method is experimental and considered primarily in treating patients with liver metastases¹ when surgery is not an option.

- It is uncertain whether or not laser-induced thermotherapy extends life in patients with liver metastases. Comparative studies are lacking. Studies published to date show that this treatment method can ablate metastases, and that risks associated with the procedure are minor. However, the beneficial effects of metastases ablation, in terms of symptoms and quality of life, has not been demonstrated in the literature.
- Use of the method should be limited to controlled trials. This implies, eg, that patients must be informed about the different treatment options and the scientific evidence available at the time.

¹ *Metastases in the liver that originate from another primary tumor.*

Technology and target group

Colorectal cancer and breast cancer are two of the most common cancer types in Sweden – annually affecting approximately 6 000 and 7 000 people, respectively. These cancers frequently metastasize to the lungs and the liver. Surgery may be the best available treatment option for metastases involving the liver in, eg, colorectal cancer, and in some cases surgical intervention is curative. However, the disease often spreads as tumors metastasize, resulting in a high risk for the appearance of metastases in multiple organs. In many cases surgery is not feasible due to the extent of the metastases or their location, or because the patient's general condition does not allow surgical intervention.

Several non-surgical techniques are available that aim to destroy tumor tissue in a way that is as gentle as possible for patients. One such method is laser-induced interstitial thermal therapy (LITT), also called laser-induced thermotherapy. LITT directs laser light through thin optical fibers to target a well-defined area and destroy the tumor. Some form of imaging technology, eg, magnetic resonance imaging (MRI), computed tomography (CT), or ultrasound is used in positioning the fibers. Laser light delivers a high level of energy that heats and destroys tissue. The procedure involves a local anesthetic and takes 1 to 2 hours to perform, including preparation.

LITT is considered to be one of several alternatives for treating liver metastases when surgery, for various reasons, is not an option. An estimated 60 to 80 percent of all patients with liver metastases are not candidates for surgery. Annually in Sweden, approximately 600 to 700 patients with liver metastases from colorectal or breast cancers would be candidates for LITT. However, this estimate is highly uncertain.

Although LITT was originally developed to cause cell death locally, it has been suggested that laser therapy might also have favorable effects on patients' immune defense. The hypothesis is that treatment could promote greater immune defense against tumors, and that the patient's immune system could detect and destroy cancer cells hiding in the body. Hence, the treatment would have curative potential.

Primary questions

- Does treatment with laser-induced thermotherapy extend survival in patients with liver metastases?
- Can laser-induced thermotherapy destroy liver metastases? Does the treatment have any effects on symptoms or quality of life?
- Is there any evidence for immunologically induced treatment effects?
- Is the method safe? What side effects or complications are associated with the method?
- What does the method cost? What is the method's cost-effectiveness?

Patient benefit

The assessment included four studies that investigated LITT in treating liver metastases, primarily from colorectal cancer and breast cancer. All of the studies were case-series without control groups. These studies included approximately 1 000 patients in total.

Whether or not LITT extends survival in patients with liver metastases is uncertain (insufficient scientific evidence ⊕○○○). Studies published to date have reported average survival of 2 to 4 years after treatment with LITT. The studies show that the method can destroy local metastases (limited scientific evidence ⊕⊕○○), and the risks for complications and side effects are minor. However, the literature does not show whether patients benefit in terms of symptoms and quality of life after ablation of metastases. We found no clinical studies of sufficient size that addressed the potential immunological effects of LITT.

It is conceivable that the method may be appropriate in palliative treatment of liver metastases in cases where surgery is not an option. Use of the method should be limited to the context of controlled trials. This implies, eg, that patients must be informed about the different treatment options and the evidence available at the time. Furthermore, it is important to offer this treatment option primarily to patients who are candidates for curative surgery.

Economic aspects

Laser-induced thermotherapy requires the acquisition of laser light sources, accessibility to appropriate imaging modalities (eg, MRI), and single-use products such as optical fibers. A Medilas Fibertom 5100-laser (Dornier, Germany) is estimated to cost approximately SEK 450 000 (USD 65 000). The approximate average cost for a LITT treatment is estimated at approximately SEK 50 000 (CAD 7 000). Treatment costs depend on factors such as the number and size of tumors.

We were unable to identify any literature addressing the cost-effectiveness of LITT. Since the evidence currently available does not enable an appraisal of the method's effectiveness, it is not possible to determine its cost-effectiveness.

Four levels are used in grading the strength of the scientific evidence on which conclusions are based:

Strong scientific evidence (⊕⊕⊕⊕). Based on high- or medium-quality studies containing no factors that weaken the overall judgment.

Moderately strong scientific evidence (⊕⊕⊕○). Based on high- or medium-quality studies containing isolated factors that weaken the overall judgment.

Limited scientific evidence (⊕⊕○○). Based on high- or medium-quality studies containing factors that weaken the overall judgment.

Insufficient scientific evidence (⊕○○○). The evidence base is insufficient when scientific evidence is lacking, the quality of available studies is low, or studies of similar quality are contradictory.

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SBU evaluates healthcare technology

The Swedish Council on Health Technology Assessment (SBU) is a national governmental agency that assesses healthcare technologies. SBU analyzes the benefits, risks, and costs of different methods and compares the scientific facts to prevailing practices in Sweden. SBU's goal is to provide stronger evidence for everyone engaged in shaping the delivery of health services.

The SBU Alert reports are produced in collaboration with experts from the respective subject areas, the National Board of Health and Welfare, the Medical Products Agency, the Swedish Association of Local Authorities and Regions, and a special advisory panel (the Alert Advisory Board).

This assessment was published in 2011. Findings based on strong scientific evidence usually continue to apply well into the future. However, findings based on insufficient, limited, or contradictory evidence might have already been replaced by more recent findings.

The complete report is available in Swedish.

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