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Review Article

A brief review on Laser Treatment in Oncology

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ABSTRACT

Laser therapy uses an intense, narrow beam of light to remove or destroy cancer and abnormal cells that can turn into cancer. Tumor cells absorb light of different wavelengths (or colors) than normal cells do. So, tumor cells can be targeted by selecting the proper wavelength of the laser. Laser therapy is a type of local treatment, which means it treats a specific part of your body.

More extensive comparative studies of up-to-date surgical procedures, regarding the duration of surgery when a laser is used versus a scalpel, are missing so far. Using an electrotome can provide sufficient hemostasis during the tissue cut as well, but electrocontractility of the underlying muscle tissue cause a reduced accuracy of the surgical cut compared to laser resections

Key words: Cancer, Radiation therapy, laser therapy, electrotome, Tumor cells

1. INTRODUCTION

The word LASER stands for **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation.

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Tumor cells absorb light of different wavelengths (or colors) than normal cells do. So, tumor cells can be targeted by selecting the proper wavelength of the laser. Laser therapy is a type of local treatment, which means it treats a specific part of your body.(20)

Cancer remains leading cause of death globally.The International Agency for Research on Cancer(IARC) recently estimated that 7.6 million deathsworldwide were due to cancer with 12.7 million newcases per year being reported worldwide. A significant proportion of this burden is borne by developingcountries; 63% of cancer deaths are reported to befrom developing countries [1, 2, 3].

Lasers can be used instead of blades (scalpels) for very careful surgical work, such as repairing a

damaged retina in the eye or cutting body tissue. They can also be used to heat and destroy small areas (such as some tumors), or to activate light-sensitive drugs.

Tumors consistent with a neoplasm exhibit an uninhibited local growth pattern. Benign tumors grow by crowding out. The therapeutic "gold standard" is the surgical enucleation of the tumor tissue. The surrounding healthy tissue can be spared. Semi-malignant and malignant tumors on the other hand invade neighboring tissue structures in a destructive way.

Semi-malignant tumors don't spread through metastasizing. Malignant tumors tend to spread through distant metastases – depending on the stage of the tumor disease, neo-adjuvant or adjuvant radiotherapy and chemotherapy has to supplement the surgical tumor treatment. Radical resection of the tumor tissue is the therapeutic standard for semi-malignant and malignant tumors.(4)

According to the Women's Cancer Society announced that every 35 women in the country, a person diagnosed with breast cancer. [1]

In 2012 alone, the risk of developing obesity in developed countries, 481 million people in these countries to cancer, especially among women. [2]

Tobacco:

Tobacco use is essential in the development of cancer in the respiratory tract. 90% [3] of developing lung cancer because of smoking occurs. Smoking is the most important factor in the occurrence of premature death in America is an isolated environment. Countries to cancer, especially among women. [5]

The consumption of alcohol on the risk of cancers of the mouth, esophagus and liver cancer risk increases due to alcoholic cirrhosis.

Types of lasers used in surgery

Argon lasers are primarily used in ophthalmology. The blue light of argon lasers is absorbed by blood, therefore they are used for photocoagulation of small blood vessels.

Carbon dioxide lasers are used in a number of surgical fields as laser scalpels. CO_2 lasers have many advantages - they produce a very thin incision and as a result of the photocoagulation of capillaries also minimize bleeding during the surgery.

Dye lasers are used in dermatology and gastroenterology. The laser beam of the dye laser causes a fragmentation of biliary and kidney stones. Because of the tunability of their wavelengths, dye lasers are also used in diagnostics to elicit fluorescence or phosphorescence in examined molecules.

Excimer lasers (KrF, ArF) emit UV radiation and produce an extremely neat incision. Because of that, they are used during angioplasties to clear clogged blood vessels. Excimer lasers are also used in ophthalmology to correct myopia and astigmatism.

Neodyme lasers are used mainly in gastroenterology. They are inserted endoscopically into the alimentary canal to stop a bleeding or to clear the GIT of patients with inoperable conditions.(6)

2. Radiation Therapy

Radiation therapy (also called radiotherapy) is a cancer treatment that uses high doses of radiation to kill cancer cells and shrink tumors. At low doses, radiation is used in x-rays to see inside your body, as with x-rays of your teeth or broken bones.

External Beam Radiation Therapy

External beam radiation therapy comes from a machine that aims radiation at your cancer. The machine is large and may be noisy. It does not touch you, but can move around you, sending radiation to a part of your body from many directions

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Internal Radiation Therapy

Internal radiation therapy is a treatment in which a source of radiation is put inside your body. The radiation source can be solid or liquid

When used to treat cancer, radiation therapy can cure cancer, prevent it from returning, or stop or slow its growth.

Skin and the very early stages of some cancers such as cervical cancer, lung cancer (non-small cell type)tumors blocking the trachea and esophagus, colon polyps or tumors of the colon orstomach blocker used [6].

Many advantages are attributed to laser surgery. Laser surgery has a hemostatic effect [7,8,9-13). It was demonstrated that disrupted arteries, veins and lymphatic vessels of up to 500 μm are closed by a CO2 laser beam due to a thermally induced contraction of the collagen in the walls of the vessels [14,15].

However, the intensity of hemostasis depends on the characteristics and settings of the individual laser surgery system. Hemostasis results in an increased visibility of the surgical site, without the need of further hemostasis or suction devices [16, 17-19].

As a result, some studies were able to demonstrate a reduction of the surgery time for performing tumor surgery in the oral cavity [18-19]. More extensive comparative studies of up-to-date surgical procedures, regarding the duration of surgery when a laser is used versus a scalpel, are missing so far. Using an electrotome can provide sufficient hemostasis during the tissue cut as well, but electrocontractility of the underlying muscle tissue cause a reduced accuracy of the surgical cut compared to laser resections [12].

Positive aspects of laser treatment

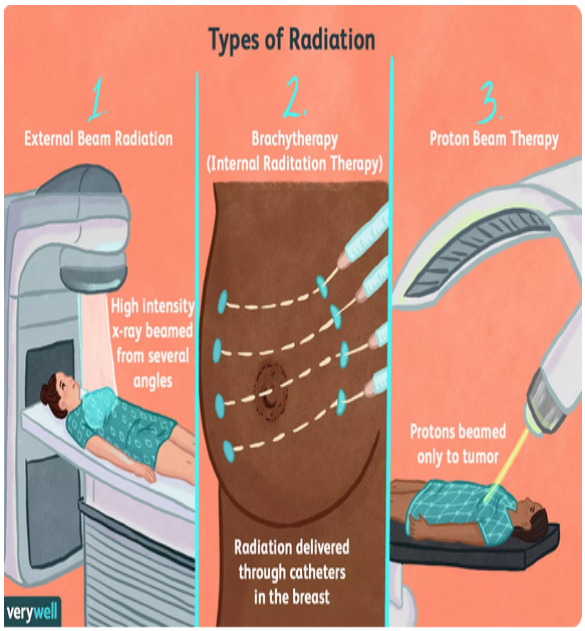
- Lasers are more precise and exact than blades (scalpels). For instance, the tissue near a laser cut (incision) is not affected since there is little contact with skin or other tissue.
- The heat produced by lasers helps clean (sterilize) the edges of the body tissue that it's cutting, reducing the risk of infection.
- Since laser heat seals blood vessels, there is less bleeding, swelling, pain, or scarring.
- Operating time may be shorter.
- Laser surgery may mean less cutting and damage to healthy tissues (it can be less invasive). For example, with fiber optics, laser light can be directed to parts of the body through very small cuts (incisions) without having to make a large incision.
- More procedures may be done in outpatient settings.
- Healing time is often shorter.

Limitations of laser treatment

- Not many doctors and nurses are trained to use lasers.
- Laser equipment costs a lot of money and is bulky compared with the usual surgical tools used. But advances in technology are slowly helping reduce their cost and size.
- Strict safety precautions must be followed in the operating room when lasers are used. For example, the entire surgical team and the patient must wear eye protection.
- The effects of some laser treatments may not last long, so they might need to be repeated. And sometimes the laser cannot remove all of the tumor in one treatment, so treatments may need to be repeated.(20)

6. DISCUSSION

Radiation can cause side effects that make it hard to eat, such as nausea, mouth sores, and throat problems called esophagitis. Since your body uses a lot of energy to heal during radiation therapy, it is important that you eat enough calories and protein to maintain your weight during treatment.(20)



Verywell / Brianna Gilmartin

https://www.verywellhealth.com/radiation-therapy-for-lung-cancer-2249343(21)

7. CONCLUSION:

The emergence of mechanistic biological studies together with improvements in radiation technology has improved the sparing of normal cells/tissues through dose fractionation and conformal radiation techniques. Radiation is also being delivered in combination with molecular targeted therapy with the aim of further improving the therapeutic ratio of the radiation treatment (22-24)

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