

Novel techniques in breast cancer management

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Breast cancer accounts for 25% of all cancers in women with over 1 million cases worldwide each year. Incidences are rising due to risk factors connected to a changing lifestyle, i.e. less physical activity and higher calorie uptake as well as changing reproduction trends and less breast feeding. Mortality rates on the other hand are decreasing due to advances in diagnostic techniques and mass screening programs, resulting in the detection of tumors in earlier stages.

Consequently there is a substantial need for new ways to manage breast cancer.

Advancing from original mastectomy towards breast conserving surgery (lumpectomy), the next step in breast cancer treatment is the progression towards minimally or non-invasive techniques.

Of the methods being discussed, radio frequency ablation is considered to be the most promising one. It has been shown that an intrinsic property of this technique results in a preferential destruction of tumor cells, leaving healthy fatty tissue of the breast intact [1], hence the term PRFA (Preferential Radio Frequency Ablation)

A treatment electrode was successively developed as well as a specially designed RF generator incorporating an extremely low-impedance output with highest IEC 60-601-1 insulation class, CF (Cardiac Floating).

In a first study 31 patients were treated with PRFA immediately prior to scheduled partial mastectomy.

After inserting the electrode into the lesion using ultrasound guidance (figure 1) a temperature of 85 °C was maintained for 10 minutes. The histopathological analysis of the resected specimen was performed using H&E as well as van Gieson-elastin staining.

Thirty-one patients were treated of which 26 resulted in complete ablation of the invasive carcinoma and thus a success rate of 84%.



Figure 1 Insertion of the needle electrode into the breast using ultrasonographic guidance.

The study showed that US guided preferential radio frequency ablation is safe and feasible when dealing with small and well selected breast carcinoma. Crucial is a precise placement of the treatment electrode based on a correct preoperative radiologic diagnose. Since an ablation of the tumor halts cancer cell spreading this technique could be applied not only as a possible substitute for lumpectomy in the future but also as an adjuvant measure.

Mass screening programs result in a huge number of women that will undergo a sampling procedure to obtain tumor material for pathological examination.

In Swedish health care fine needle aspiration (FNA) is the dominant initial sampling technique since its establishment by Sixten Franzén and others. One of its problems is the frequent amount of insufficient sampling yields. Given this fact it is surprising that common injection needle which are manufactured for completely different needs are applied. We developed a specialized fine needle that increased the sampling yield threefold and therefore decreased the frequency of insufficient samples significantly [2]. Another frequent issue is the difficulty to penetrate more fibrous lesions. For this purpose we designed a semiautomatic device ("CytoTest") that uses longitudinal mechanical vibration and rotation to counteract this problem and further increase sampling yields [3].

Sampling tumor material with a needle will misplace cancer cells into peripheral tissue such as blood and lymph vessels. Having designed an antiseeding needle and apparatus we are able to destroy tissue in close proximity to the needle and thus sterilize the needle channel while leaving the sample inside completely unaffected. So far 15 patients have undergone an FNA sampling procedure using this antiseeding technique. The results look promising with no additional discomfort for the patient.

By combining these minimally invasive techniques we aim to improve the treatment procedure from diagnosis to treatment for better outcomes.

REFERENCES

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