

## Biomagnetism and Prostate

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### Editorial

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### Editorial

Prostate cancer is a dangerous disease that is frequently identified at a late stage and is accompanied by high mortality. Novel techniques are necessary in order to identify it at an early stage. Biomagnetometry is a technique that has been successfully used in differentiating breast, ovarian lesions and myomas [1,2]. We have investigated the function of bio magnetic activity in distinguishing cancerous from benign prostate lesions. The prostate gland, as every alive tissue, produces spontaneous magnetic activity caused by ionic movements across the plasma membrane. This activity, though extremely weak can be recorded by a superconducting quantum interference device (SQUID).

We used a single channel second order biomagnetometer (DC SQUID model 601, Biomagnetic Technologies) in an electrically shielded room. The data were achieved from 47 patients with palpable prostate lesions. Twenty-four had prostate carcinoma and 23 benign prostatic hyperplasia (BPH). Every patient lied supine on a wooden bed, with no metallic objects. Biomagnetic data of the prostate activity were carried out with a detector placed on the abdomen above the symphysis pubis. We selected 8 points for examination (4 located at the very centre of the prostate lesion, and 4 at the periphery of the examined part). For every point, 32 sec duration recordings were taken with the SQUID detector placed 3 mm above each point in order the maximum magnetic flux to pass through the coil. All recordings were done prior to histological examination and the operators were blinded to medical and transrectal ultrasound findings [3,4].

The biomagnetic activity of malignant tissues is an indication of tumour hyperemia and neo-vascularisation and is caused by the movement of ions across the plasma membrane. The activity of the prostatic lesions were of high amplitude in the majority of carcinomas and of low amplitude in most BPH patients. In every case, the frequencies considered were distributed within the range of 2-7 Hz. The corresponding spectral densities of the magnetic field were of high amplitude in the malignant prostatic neoplasms and of low amplitude in benign prostatic lesions.

We also investigated the complexity underlying the dynamics which characterized the benign and malignant prostate lesions, using chaotic analysis. By applying the Grassberger-Procaccia algorithm to the diamagnetic data we found clear saturation in malignant prostate lesions and not clear saturation in benign ones. This substantiates an elevated angiogenic activity in prostate cancer than in BPH lesions. When we estimated the correlation dimension, we found a saturation value for the cancer lesions that demonstrates a lower complexity of the system in compare to the BPH, which is characterized by higher complexity [3,4].

Malignant tissues, by virtue of their expansion and increased ionic movements, produce magnetic fields of higher intensity than benign ones. In our studies the biomagnetic activity of the prostatic carcinomas was found lower compared to breast carcinomas. These results could be explained by the lower angiogenic activity of prostate carcinomas, in compare to other malignancies [3,4].

Biomagnetic activity of prostate lesions might prove a valuable means in detecting prostatic carcinomas and might suggest extra information for understanding better the biology of prostate cancer. The technique is non-invasive, harmless, consistent, fast and simple to interpret with a disadvantage the quite big distance between the suprapubic biomagnetic detector and the centre of the prostate gland (3-5 cm). However, the exact function of biomagnetic activity in prostate cancer detection and biology remains to be additional investigated with extra studies to be conducted [3,4].

## References

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