



Heating Up the Fight against Cancer

A High-Tech Startup Based in Jerusalem

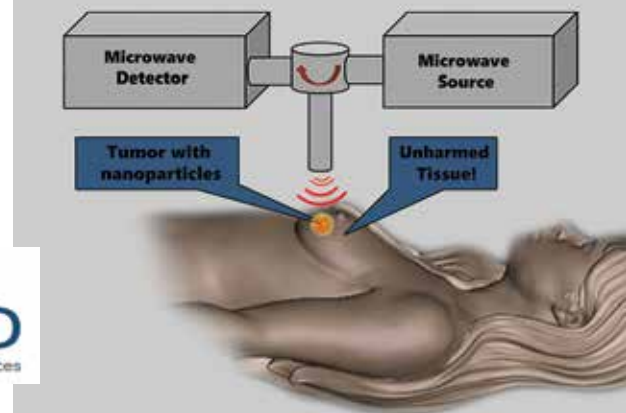


By Anan Copty

Breast cancer is the second most common cancer in the world. There are about 1.7 million new cases worldwide each year. Although breast cancer is mainly an issue for women, men are affected in 1 out of every 100 cases. It ranks as the fifth most prevalent cause of death from the overall types of cancer, yet the survival rate in developed countries can reach 80 percent. Poor countries have a lower survival rate of 40 percent, mainly attributed to a late-stage detection of tumors. Women over the age of 40 are generally recommended to have a mammogram (an X-ray image of the breast) at least once a year.

Traditional treatments of breast cancer include surgery, radiotherapy, and chemotherapy. For early-stage cancers, when the tumor is less than 4 cm in size, surgery known as lumpectomy is usually recommended. Typically, the tumor is removed along with an extra margin of tissue from the breast to ensure that no cancer cells remain. The procedure is followed by radiotherapy to terminate any cancer cells that were not removed by the surgery. In some cases, when the cancers are more advanced and invasive, mastectomy or complete removal of the breast tissue is performed. This may be followed by chemotherapy or radiotherapy, according to the oncologist's recommendation. Today, the patients are more involved in the treatment options due to the emotional and lifestyle changes associated with the treatment process. Women patients and their families need to make educated, well-researched decisions that meet their specific needs and should challenge the accepted norms if they find them inappropriate.

The application of noninvasive medical treatment against cancer used in NIMD. Image courtesy of the author.




According to researchers in the field, too many patients have opted for a complete mastectomy while a minimal lumpectomy would have provided the same results according to the latest clinical studies.

After witnessing many local friends from Jerusalem impacted by this deadly disease, I began to explore the possibility of creating a more viable treatment for cancer. Using my background in localized microwave interaction studies during my doctoral studies in physics, my prior experiences in Boston at Harvard Medical School and at a research and development company, I embarked on extensive research on the topic of cancer treatment in order to eventually develop a suitable technology. In January 2015, two Palestinian scientists from Jerusalem – myself, a physicist, and Dr. Butros Hallac, a physical chemist – established a startup company for this purpose. The two of us met while working at Intel Corporation. After examining the technology and the market needs, we quit our secure jobs and were fully dedicated to establishing NIMD (noninvasive medical devices) in January 2015.

NIMD Ltd, a new Jerusalem-based startup, has come up with an innovative medical device to help tackle the cancer treatment problem. The solution is based on microwave radiation

Noninvasive medical treatment used in NIMD applies nanotechnology by administering nanoparticles that, due to their specific size, attach to cancer cells only. When heated with microwave radiation, these particles destroy the cancer cells, leaving the surrounding tissue intact with minimal side effects.

and nanotechnology. Nanoparticles, about 1,000 times smaller than the width of a human hair, are injected into the patient's body either through direct or intravenous injections. The nanoparticles are able to find their way to the tumors through a specialized biological process called the "enhanced permeability and retention" effect and attach to cancer cells only. A microwave system with a microwave antenna or applicator is placed just above the patient's skin. A microwave beam from the applicator is focused on the tumor where the attached nanoparticles absorb this beam more effectively than the surrounding tissue. In this way, only cancer tissue is heated to ablative temperatures (or temperatures above 50°C) that kill



cancer cells while healthy cells remain unaffected as their temperature remains close to normal body temperature. The technology may be applicable to breast cancer, skin cancer, head and neck cancer, and other localized solid-tumor cancers.

We have tested the technology on human-like models and on mice injected with breast cancer cells. The results were exceptional, and we are currently conducting more advanced animal studies in preparation for human clinical trials. With this technology, we believe that we can provide an alternative to surgery, preserving the shape of the breast and improving the quality of life for patients. Furthermore, as the procedure uses microwave frequencies, just like the ones used in mobile phones, the radiation is nonionizing and may provide an alternative to conventional treatments which are costly and have side effects.

One of our main challenges was the almost nonexistent startup ecosystem that supports such projects. Most startups in the Palestinian community in Ramallah or even Nazareth are focused on software development, information technology, gaming, and travel services, among others. This is also very common in the surrounding Arab countries such as Jordan, Lebanon, and Egypt. Medical-device companies require a substantially higher investment and are multi-disciplinary and multi-national in nature. In order for a medical-device company to have its products penetrate the European and American markets, there must be a broad set of stringent regulatory standards, such as those of the FDA in the United States and CE marking in Europe. Clinical studies and research publications at well-respected academic hospitals are essential, especially if the technology is considered innovative or disruptive. These requirements involve huge costs for a startup to reach its goals.

The concept of noninvasive medical

devices was embraced by local cancer specialists from the Palestinian, Israeli, US, and European communities. We are currently expanding our advisory board and board of directors to include well-respected physicians, strategists, and business experts. NIMD is also actively raising capital and looking for strategic partners to continue its operations at home and abroad.

We believe that our device can also be extremely helpful for the medical community in Palestine as it can, in many cases, provide an alternative to radiotherapy and surgery for patients with early-stage breast cancer. At present, the Israeli government prohibits radiotherapy in the Palestinian territories. Cancer patients from the West Bank and Gaza often travel to Jerusalem's Augusta Victoria Hospital to receive radiotherapy treatment. As the technology of NIMD is very low power, compact, and versatile, we hope that it can reach every cancer-treatment center in Palestine, thus helping to save lives and improve the quality of life for patients worldwide.

Anan Coptly received a BS from Gordon College, an MS from Boston College, and a PhD in physics from the Hebrew University of Jerusalem. He has worked at the Harvard Physics Department in particle-trapping experiments, the Harvard-Smithsonian Astrophysics Center, the Harvard Medical School, and as staff scientist at Radiation Monitoring Devices, Boston. During his PhD studies, he developed near-field microwave applicators to study the interaction of microwaves with biological media. Anan joined Intel in 2004 where he worked in the area of research and development of new technologies and later on led the Intel device physics group in the startup phases of 45nm, 22nm, and 14nm technologies. Anan founded Noninvasive Medical Devices in 2015, a startup involved in cancer treatment through microwave heating coupled with nanotechnology (www.NIMD-Ltd.com). Anan is married and the proud father of two children.