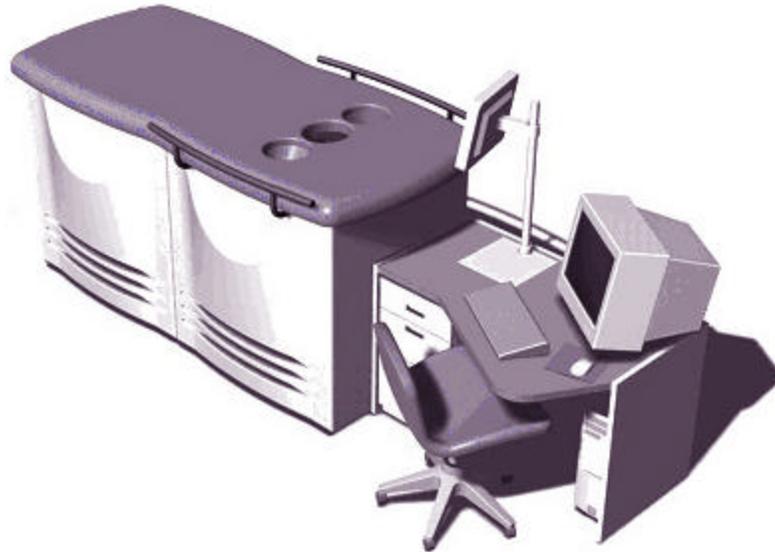




## **COMPUTERIZED THERMAL IMAGING, INC.**

### **BCS 2100**



#### **What is the BCS 2100?**

The CTI BCS 2100 is a new medical device that has been developed for use as an adjunct to mammography x-ray to determine if a mammographically identified breast mass may be followed rather than biopsied. Because it accurately records temperature changes occurring in the breast, the BCS 2100 provides physiological information allowing the characterization of suspicious breast lesions identified from images captured by mammography x-ray.

## **Why do we need the BCS 2100?**

Over 1,300,000 breast biopsies are performed in the United States and over 4,500,000 breast biopsies are performed worldwide each year, 80% have benign findings. Breast biopsies are traumatic experiences, expose patients to clinical risk, are uncomfortable and are costly. The BCS 2100 can reduce the large number of breast biopsies performed every year on patients who do not have breast cancer.

## **How does the BCS 2100 work?**

The CTI BCS 2100 is based on dynamic infrared imaging, a process in which an infrared imaging camera captures and records a series of images over time in response to changing air temperature. It will then determine if the infrared patterns show a profile indicating a benign condition or patterns that may indicate malignancy. Dynamic infrared imaging provides information about active processes, and provides different information than x-rays, for example, which produce anatomical images that are not associated with active processes. The CTI BCS 2100 provides dynamic infrared images and information about the physiological processes occurring in the human breast over time (approximately 3 minutes) in response to a cooling challenge. The BCS 2100 is designed to obviate the need for some biopsies.

There are several physiologic features related to malignant tissue that may contribute to a thermal or infrared signal that is higher than the infrared signal associated with benign tissue. One feature that may contribute to an elevated infrared signal in malignant tissue is increased blood flow in the area surrounding the malignancy. Studies using ultrasound have reported increased blood flow in breast carcinomas compared to benign lesions. One likely contributing factor is angiogenesis, the formation of new capillaries from existing blood vessels, which supplies the nutrients required by a neoplasm. Although angiogenesis is important to normal physiologic processes such as wound healing it also plays a key role in tumor growth. Angiogenesis is linked to both the growth of breast cancer as well as to its metastatic potential.

Another likely factor contributing to the infrared signal associated with malignant tissue involves the smooth muscle relaxant, nitric oxide (NO). NO induces vasodilation, detectable as increased regional heat production and altered local thermoregulatory responses. Malignant human breast cancer cells have been shown not only to produce this mediator, but the increased NO release may also contribute to metastasis. Other features of malignant tumors that may contribute to their thermal pattern are enhanced metabolic activity and tumor proliferation.

### **What happens during the BCS 2100 procedure?**

The BCS 2100 captures and analyzes a series of infrared pictures of a patient's breasts while the breasts are exposed to changes in air temperature. The infrared camera is mounted within a specially designed table that also contains a climate control system. To begin infrared imaging, a patient lies in the prone position and suspends the first breast to be imaged through the opening in the top of the table. During imaging, the climate control system in the bed exposes the suspended breast to a programmed change in air temperature. More than one hundred images and 8,300,000 temperature data points are collected for each breast over a three-minute time period. Each pixel on the series of images represents the temperature of a specific point on the breast through time and in response to the changing air temperature.

After both breasts have been imaged, the BCS 2100 processes and compiles all the infrared information for each breast into a single composite image for use in the analysis for that breast. In order to determine the infrared test result, a physician reviews the patient's composite infrared image using interactive software and locates a region of interest on the image that corresponds to the location of a mammographically identified breast mass. The BCS 2100 uses algorithms to analyze the infrared profiles of the pixels identified by the physician, and calculates a mathematical score that reflects the likelihood that the area is free of cancer. The BCS 2100 compares this score to an internal threshold, and displays a negative or positive infrared test result. A negative infrared test result indicates that there is a very high likelihood that the area is free of cancer. The BCS 2100 procedure is rapid, non-invasive and painless. It does not require compression of the breast, exposure of the breast to ionizing radiation or the use of imaging agents.

### **What was the safety profile of the BCS 2100 during its clinical trial?**

The BCS 2100 clinical trials involved over 2,400 subjects. Very few adverse events of any kind were observed. Specifically, a total of two adverse reactions related to use of the BCS 2100 were noted. Both were rated as "mild" and associated with the subjects' difficulties in positioning themselves on the device. Both events resolved. Two additional adverse events were reported that were assessed as not related to the device.

### **What did the clinical trial show with respect to BCS 2100 effectiveness in obviating the need for some biopsies in benign breast conditions?**

The primary objective of the clinical trial was to demonstrate that the CTI BCS2100 could be used to lower the number of biopsies that are performed on benign masses without unduly delaying the diagnosis of cancer. This was demonstrated by assessing the performance of the IR imaging device when used as a follow-up procedure after a suspicious mass had been identified through mammography.

All patients enrolled in the clinical trial were identified by the physician to undergo a breast biopsy. In the original PMA submission, the BCS 2100 evaluated 322 benign masses and 90 malignant masses. Analysis showed that all cancers were identified for 100% sensitivity, and 58 of 322 benign masses were correctly identified for a specificity of 18%. At the request of the FDA, CTI performed a confirmatory study with 63 benign masses and 15 malignant masses. Analysis of lesions in the confirmatory study showed that the BCS 2100 correctly identified 14 of 15 malignant masses for sensitivity of 93.3 % and correctly identified 12 of 63 benign masses for specificity of 19.2%. When the original PMA patient set is combined with the confirmatory patient set, the BCS 2100 correctly identified 104 of 105 malignant masses for sensitivity of 99% and 74 of 385 benign masses for specificity of 19.2%. In comparison, mammography performance was 100% sensitive since all malignant lesions in the study were sent to biopsy and 0% specificity since all benign lesions also went to biopsy. Based on the results of the study, approximately 1 out of 5 who had benign masses who otherwise would have gone to biopsy would have been spared the need for biopsy on a benign mass. At the same time a small proportion of women who had cancer would have had their diagnoses delayed by 4-6 months.

### **Who will buy and use the BCS 2100?**

If the BCS 2100 is approved, CTI plans to market exclusively to MQSA certified facilities. The BCS 2100 will be in the control of the board certified radiologists associated with those facilities.

### **What is CTI doing to insure the success of the BCS 2100?**

CTI has submitted a manuscript describing the clinical trial and subsequent results to the American Journal of Roentology (AJR). The peer reviewed manuscript entitled Efficacy of Computerized Infrared Imaging Analysis When Evaluating Mammographically Suspicious Lesions has been reviewed by the AJR editorial staff, which is comprised of board certified radiologists and has been accepted for publication in January 2003.

CTI established a Medical Advisory Board to help facilitate the breast imaging system's acceptance by the medical community and to accelerate its broad clinical use following the system's approval by the U.S. Food and Drug Administration (FDA). The Board has assisted CTI in its ongoing FDA review process for the BCS 2100, including preparations for FDA panel review. In addition to providing ongoing clinical expertise and recommendations, board members advise the Company on medical product and service enhancements.

The board is comprised of four medical doctors. Kathy Plessner, M.D. serves as Chairman of the Medical Advisory Board with Robert Lee Hamm, M.D.; Yuri R. Parisky, M.D.; and A. Patricia Romilly, M.D. serving as board members. Dr. Plessner was most recently

the Chief of Breast Imaging at St. Vincent's Hospital and Medical Center in New York City, with an appointment as an Assistant Professor of Radiology at New York Medical College. Dr. Parisky is the Director of Breast Imaging Services at USC Norris/Lee Breast Center in Los Angeles and an Associate Professor of Radiology at the University of Southern California. Dr. Romilly is the Head of the Breast Imaging Section at H. Lee Moffitt Cancer Center & Research Institute in Tampa, an Assistant Professor of Radiology at the University of South Florida, and a leader and pioneer in radiology and breast imaging for more than 25 years. Dr. Hamm is the Chief of Radiology and Director of Breast Imaging at Providence Hospital in Washington, D.C.

## **Conclusion**

The BCS 2100 is a safe non-invasive device that can be used by radiologists to confirm or obviate the need for biopsy in some suspicious masses. CTI is seeking a positive recommendation from the Radiological Devices Panel and subsequent approval from the FDA to market the BCS 2100 as a safe, non-invasive and effective means to avoid biopsy of benign breast masses.