

# Philips' k-t BLAST enables one-breathhold global function studies



Scott Flamm, M.D.



Steffen Huber, M.D.

**Clinical investigators at Texas Heart<sup>®</sup> Institute at St. Luke's Episcopal Hospital are comparing the k-t BLAST technique with the most advanced clinical MRI techniques in use today in studies of cardiac global function. k-t BLAST exploits frame-to-frame redundancies in heart motion to enable acquisition of a greatly reduced data set and thus dramatically increased acquisition speeds. Preliminary results suggest that k-t BLAST's data acquisition efficiency will permit a complete global function study in a single 20-second breath hold, versus multiple breath holds of 10-12 seconds each.**

In the last several months, physicians at Texas Heart Institute at St. Luke's Episcopal Hospital have been seeking to determine if k-t BLAST can result in more efficient cardiac function studies that are also easier for patients to comply with.

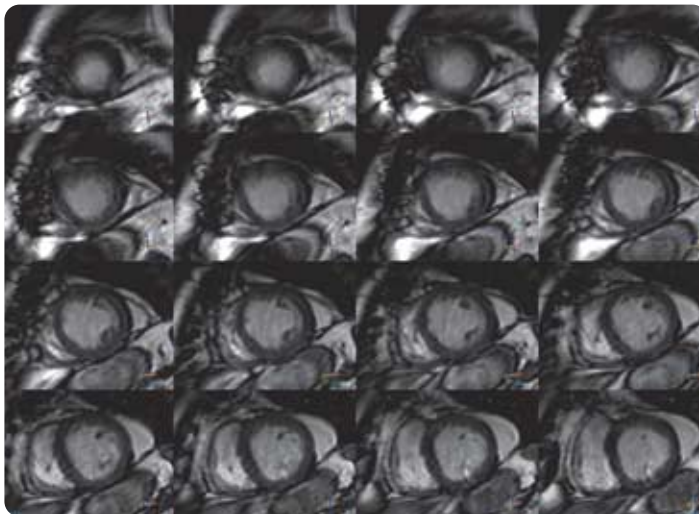
The key is acquisition speed. k-t BLAST (k-t space Broad-use Linear Acquisition Speed-up Technique) collects image data significantly faster than conventional MRI sequences, by exploiting frame-to-frame image redundancies over time. When applying k-t BLAST to the heart – the movement of which also is influenced by breathing – image pixels in the relatively static chest wall, for example, would be shared by all the time frames in an acquisition. Conversely, although the heart is very mobile, its motion is periodic and

generally smooth, enabling predictions of frame-to-frame changes. The more predictable the changes, the faster acceleration factors are possible.

“To determine these image correlations in k-space and time, we acquire an initial set of low-resolution training images,” says Steffen Huber, M.D., visiting cardiovascular imaging research fellow from the Berlin Heart Center. “These correlations or redundancies will determine how fast we can accelerate the acquisition.”

## **k-t BLAST allows single versus multiple breath holds**

Dr. Huber is principle investigator in an ongoing study comparing k-t BLAST with three other MRI techniques. One is a 2D FFE sequence, the current MRI gold standard for cardiac functional imaging, while the two other methods are a 3D EPI technique and a 3D Balanced-FFE technique.



*3D k-t BLAST acquisition in a single breathhold (21 sec.). Short axis slices 6 to 21 are shown. k-t BLAST realizes 5x speed-up: 25 slices, 20 phases, phase interval 35 ms, voxels 2.4 x 2.4 x 4 mm, TE 1.7 ms, TR 3.5 ms, flip angle 45°.*

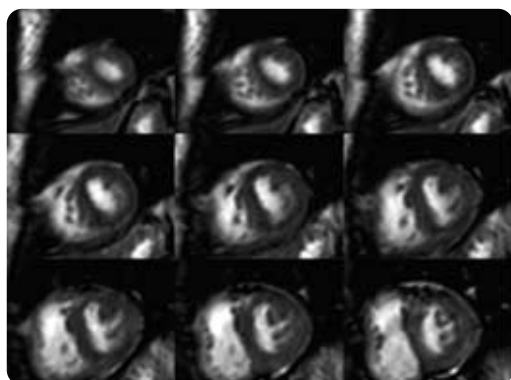
“From the standpoint of global cardiac function parameters such as ejection fraction and stroke volumes, k-t BLAST provides similar spatial resolution as the other MRI techniques,” Dr. Huber says. “The advantage is that the k-t BLAST study can be performed in just one 20-second breath hold, while the standard 2D FFE method still requires multiple 10-12 second breath holds, which can be tiring for the patient and may result in slice misregistration between acquisitions.”

#### Additional applications

St. Luke’s clinicians are considering other uses for k-t BLAST as well. A hybridized technique that integrates Turbo Field Echo

(TFE) with SENSE and k-t BLAST could help yield more slices in myocardial studies, according to St. Luke’s radiologist cardiovascular imager Scott Flamm, M.D., “One of the criticisms of using MRI for myocardial studies is lack of complete coverage of the left ventricular myocardium,” he says. “If we can use k-t BLAST to acquire more slices without sacrificing image quality that will be a real benefit.”

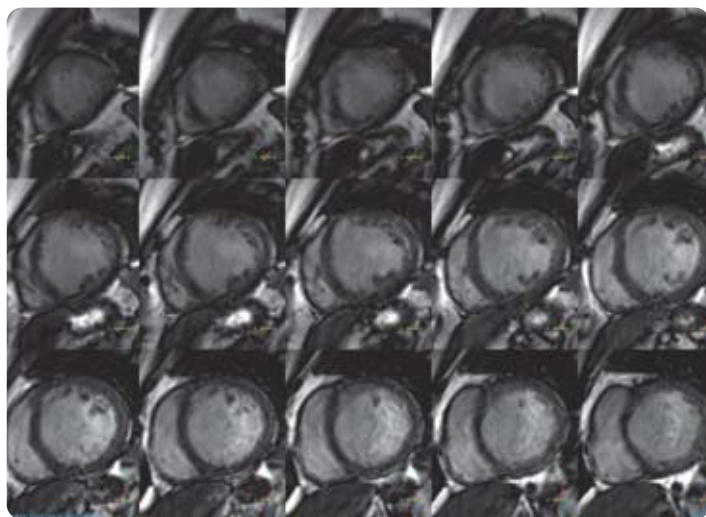
Dr. Flamm and Dr. Huber are collaborating with Philips clinical scientist Raja Muthupillai, Ph.D. on the k-t BLAST functional studies and other cardiac research. ■



*k-t BLAST applied in LV function analysis in a patient with suspected myocardial infarction.*

**Net Forum**  
[www.philips.com/netforum](http://www.philips.com/netforum)

Visit the MRI NetForum Community to view movies made with k-t BLAST.



*Patient with dilated left ventricle, short axis view. Single breathhold 3D acquisition with 5x speed-up by k-t BLAST. 20 phases, phase interval 35 ms, 25 slices, voxels 2.4 x 2.4 x 4 mm.*