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Case Study

BODYTOM® PORTABLE, FULL-BODY, 32-SLICE CT SCANNER USE AT MOUNT CARMEL EAST HOSPITAL

Improving accuracy and patient outcome in neurosurgery by bringing full CT capabilities to the OR

THE CUSTOMER

Mount Carmel East Hospital in Columbus, Ohio is well-known for its surgical expertise and commitment to using the latest technology to improve patient outcome. With this drive to be on the cutting edge of surgical technologies, Mount Carmel East became the first hospital in Ohio to feature the BodyTom portable CT scanner in its operating room. Director of the Division of Neurosurgery, Dr. Bradford Mullin, was integral in the decision to utilize the innovative CT scanner.

***Dr. Bradford Mullin**, Director of the Division of Neurosurgery, Mount Carmel East Hospital*

THE CHALLENGES

Prior to owning the BodyTom, neurosurgeons at Mount Carmel East were using an O-arm for spinal fusion cases.

"With the O-arm, the imaging was not anywhere near as clear. The O-arm is really a fancy C-arm from a lot of different directions that's reconstructed into three dimensions. You lose bony detail, and as the patient's body mass index increases, the image degrades more and more. With the BodyTom, you can see edges much better. It has no limitation in number of levels that it can image, where the O-arm does," Dr. Mullin says.

Mount Carmel East's focus on the continuous improvement of patient outcome and reducing the possibility of errors were also driving forces behind the search for a new intraoperative technology.

"We had used the O-arm quite extensively for spinal fusion cases. One of the challenges we faced was that with the O-arm software you cannot completely encompass the entire spine in a single scan. If you were doing a really large case you needed to use multiple scans. You were increasing the radiation dose the patient was subjected to in order to get all of the data that the surgeon needed. There was also a lot of flipping back and forth between images to re-verify for the surgeon to make sure they were looking at the right level. We felt that was a lot of opportunity for error that we weren't comfortable with," said Emily McCune, Clinical Manager Neurosurgery

Reducing radiation exposure was also a concern for the surgeons and OR staff at Mount Carmel East. "One thing that has concerned me as a surgeon practicing over forty years is radiation exposure and its effect on health. The OR staff is continuously getting some scattered radiation. You wear leaded gowns, but your face isn't covered, your eyes aren't covered. Your thyroid may or may not be covered. Radiation scatters all over the place. We needed a technology where the staff can drop their exposure to zero," Dr. Mullin says.

THE JOURNEY

Mount Carmel East had been using navigation and intraoperative technology since approximately 1997, and the surgeons at the hospital had a clear vision of how they wanted to move forward. They investigated the use of MRI in the OR but felt that CT was better for bony constructs. MRI also had other drawbacks compared to the BodyTom.

"An MRI is a magnet so you have a lot of equipment issues with what you can and cannot use (in the OR). While you can get a lot of things that are radiolucent, you might not be able to get things that aren't metal. We felt that a CT option was ultimately going to be more versatile down the road," McCune says.

EXPERIENCE
A New Healthcare Solution

A competitor's portable CT scanner was also briefly considered but ultimately rejected due to its limitations.

"The thing we were concerned about was that the table was connected to it. Again, we felt we had better versatility by having the BodyTom that wasn't directly connected with the patient table," McCune says.

THE SOLUTION: THE BODYTOM PORTABLE FULL-BODY, 32-SLICE CT SCANNER

Dr. Mullin initially saw the BodyTom on display at a meeting of the American Association of Neurological Surgeons (AANS). He was impressed with its ability to bring full CT capabilities into the operating room.

Caption needed

Key Benefits

- Transforms any room in the hospital into an advanced imaging suite
- Provides point-of-care CT imaging wherever high-quality CT images are needed
- Allows full-body imaging with its 32-slice scanner unplugged from a wall socket
- Provides rapid scan times, flexible settings, immediate image viewing
- Minimizes the requirements for lead-shielded operating rooms

Key Features

- 85 cm gantry and 60 cm field of view, the largest field of view available in a portable CT scanner
- Battery-powered and featuring an innovative internal drive system for easy transportation from room to room
- Compatible with PACS, EMR, planning systems, surgical and robotic navigation systems
- Internal lead-shielding

IMPLEMENTATION

Mount Carmel East chose to use diagnostic staff rather than CT staff to run the BodyTom. This initially resulted in some apprehension for the radiology staff, with the necessity of learning to use the new software, as well as, operation of the CT scanner. These reservations were overcome by the extensive training NeuroLogica provided the staff.

"The training was very comprehensive. When we first received the BodyTom, they did on-site training with a handful of individuals, myself included. We had a general overview of how the machine was going to operate. When we did our first several cases, there was actually a representative of NeuroLogica here with us as we were doing our first scans with the machine. They really helped us through operating the machine." *Eric Wohlford, Diagnostic Radiographer*

As with any new, large equipment introduced into the operating room, there were some initial issues that arose in the early stages of implementation. Due to the age of the facility, there were some flooring issues in the OR that needed to be resolved. NeuroLogica worked closely with the facility engineers at Mount Carmel East to eliminate this issue. There were also some initial concerns about patient positioning and the change of the workflow in the OR.

In the first couple of weeks, "we set up mock ORs where we had surgeons, anesthesia, nursing, and radiology in the OR. When we first got our radiolucent surgical table, it did not have a split extension, which meant the patient had to be oriented in a way that took the patient's head away from anesthesia. It was originally a big change for our anesthesia department. We then incorporated a new foot board extension, which has given them better access, so that calmed their concerns about how to approach these cases," McCune says.

RESULTS

Decreased Need for Repeat Surgeries – One of the most important advantages of the BodyTom in the OR is being able to image the patient prior to closing.

"If you malplace a screw and you haven't imaged and found that out during surgery and you get the image post-operatively… Now, you've got a situation where you might have to take that patient back to surgery. There's an induction of anesthesia. There's heart risk, lung risk, and risk of stroke. You have to take the patient back and fix it when (with the BodyTom) you could have known right away and fixed it right then," Dr. Mullin says.

Improved Patient Safety – With BodyTom, better visualization means better outcome. "The BodyTom increases patient safety, substantially. Outcome is definitely related to how well construct and implementation is placed because not only can you endanger the nervous structures but also vascular structures. Also, if you don't put the screws in the right place and anchor well, the stability is less," Dr. Mullin says.

Increased Accuracy – With BodyTom's full-body, 32-slice scanning capability, navigation and placement accuracy is greatly increased. "If you're doing complex spine reconstruction work, and we have done quite a bit of that, you will have a time when the patient's anatomy is so distorted by either previous surgery or deformity that putting screws in in the old way means you are going to fail. I have patients in that category fairly commonly. Before (BodyTom), it would have been very difficult to get a surgery done. Now, it's the same as doing a simpler case." Dr. Mullin says.

Improved Patient Outcome – At Mount Carmel East, having the BodyTom portable CT scanner in the OR is about results.

"This is about patient outcome, all the way. Making sure you have the accuracy and that you aren't bringing those patients back for repeat surgeries. We wanted to be on the cutting edge and have technology that allowed us to do things that weren't possible before," McCune says.

Decreased Radiation Exposure – With the BodyTom, radiation exposure for Dr. Mullin and the OR staff has been effectively eliminated. "If you look at the radiation exposure surgeons accumulate over an entire lifetime, it's substantial. Every time they do a spine fusion, it's like getting a chest x-ray in terms of the amount of radiation. Our exposure in that room (with the BodyTom) is zero. That's hugely important in terms of health and well-being of everyone in that room," Dr. Mullin says.

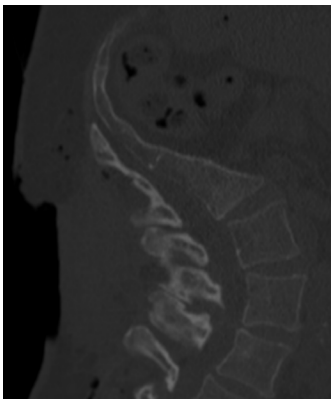
Transitioning to the use of the BodyTom rather than the O-arm has also decreased the amount of radiation to which patients at Mount Carmel East are exposed. "It's been great. (With the BodyTom) we have been able to reduce the number of scans for patients. What normally would have been two scans of the body with the O-arm is now one with the BodyTom. That is huge because whenever you do a spin with the O-arm, it's supposed to be the equivalent of about 290 chest x-rays, " McCune says.

Better Visibility – Moving from the O-arm to the BodyTom gave Mount Carmel East and Dr. Mullin better visibility of segments above and below the surgical area.

Caption needed

"The BodyTom can do the whole spine if it needs to. If you're looking at when we do fusions, one important concept is sagittal balance to see whether or not you're putting the person in balance over their pelvis. With the O-arm, you are only scanning a few segments. You don't really know what more of the spine looks like. With the BodyTom, you can see what you are doing many segments above where you're working. I think that's a big advantage," Dr. Mullin says.

Improved Images – BodyTom provides full CT capability in the OR. "After we did that first scan (with the BodyTom), I was blown away with the image quality. A lot of times we would use the O-arm and get decent enough images that we could load it into the navigation. Whereas, with the BodyTom, any time we scan we know we are going to get quality, precise imaging that is going to be able to allow us to give the surgeon the best navigational capabilities that he can have," said Eric Wohlford, Diagnostic Radiographer.



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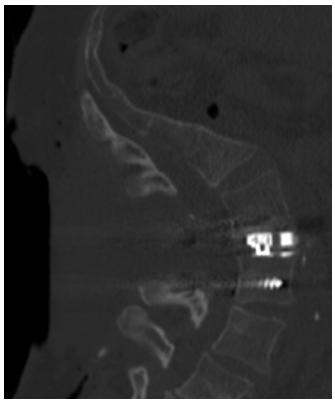

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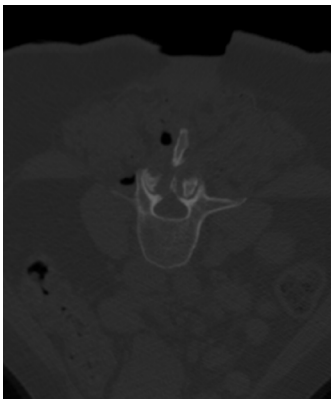

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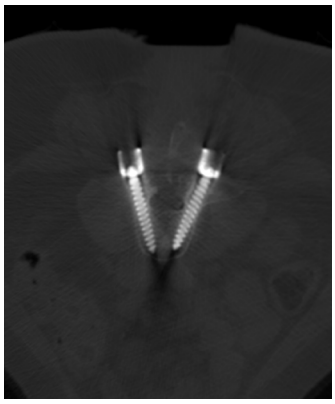

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Good Workflow – Mount Carmel East has been able to introduce the use of the BodyTom in the OR without adding extra time to cases. "When you institute new technology, you want it to improve the quality but not create a big delay in a case. When you are operating on someone, the longer the spine is open, the higher their chance of infection. We actually timed how long it took us to get the scan and we've got it down to where it's no different than with the O-arm," Dr. Mullin says.

MOUNT CARMEL EAST'S EXPERIENCE AND THEIR FUTURE WITH BODYTOM

As with the adoption of any new technology, there was a learning curve in the implementation of BodyTom. However, with the results they have seen in spinal fusion cases, the medical staff and neurosurgeons at Mount Carmel East are already looking to finding novel applications for the BodyTom.

"Intraoperative imaging is quickly becoming an actual standard of care. We have done a handful of cranial cases. That's where this is really going to come in. We're going to start doing tumor resections, specifically transsphenoidals

with this. Those patients routinely get a CT scan post-op. (With BodyTom) we have confirmation in the OR that they have resected all of the tumor, eliminating having to take the patient to the CT department," McCune says.

Dr. Mullin feels that bringing the BodyTom into the OR has enhanced patient safety, surgical outcome, and even his own confidence.

"I think that it (BodyTom) advanced me along the navigation and imaging techniques. I can basically take any spine, spine deformity and be certain that I can accomplish the goals. I can say "Sure, I can do that." Basically on any spine I have to work on. I am doing the best I can for a patient, every time I do it," Dr. Mullin says.

BodyTom Portable, Full Body 32-Slice CT Scanner and Workstation