

May 13, 2010

Tigard company builds DYNAMIC ARMS

Advanced Arm Dynamics not only builds prosthetic upper limbs, but helps its patients get their lives back to normal

By Nick Peterson

When you first see Chino Acosta, there is nothing unusual that catches your eye — even if you know beforehand that he is missing an arm.

Then you look him up and down, and you see it. His left hand. It looks a little different, but only slightly. If it was his right hand, you wouldn't hesitate shaking it.

But it's his left hand, and he can do some amazing things with it.

Acosta has a dynamic arm — an electronic prosthesis, created by Tigard's Advanced Arm Dynamics — an arm that helps him lead a fairly normal life.

And he likes it a lot.

"One of the things I like about it is for driving," Acosta says, making a motion like he's holding onto a steering wheel with his artificial hand. "Driving is really comfortable."

Acosta lost his hand in a job-related accident six years ago. After some reconstructive surgery that didn't produce the results he was hoping for, he decided to have his arm amputated just below the elbow. Then he came to Advanced Arm Dynamics and they built him the arm he now uses — a myoelectric prosthesis that has rotation at the wrist and an open-close function for the hand. And it looks surprisingly natural.



JAIME VALDEZ / TIMES NEWSPAPERS

Chino Acosta demonstrates the opening and closing action of the myoelectric hand that was created by Tigard's Advanced Arm Dynamics

Acosta's face lights up with a little, sly smile as he rotates his hand 360 degrees — something those of us with natural hands can't do.

The "skin" on his prosthetic hand and forearm is made of silicone and painted to match Acosta's natural skin. The forearm even has hair taken from his other arm embedded in it.

The only problem, Acosta jokes, is that in the summertime it doesn't tan like his real arm.

The hand looks uncannily real, right down to the veins on the top of the hand and the fingernails — which, by the way, never need clipping.

The movement of the hand is limited. It is fixed in a cupped, gripping shape, looking like it's constantly ready to grab something. Besides the unlimited rotation, its basic movement is to open and close.

Those movements are controlled by the flexing of two basic muscles in Acosta's forearm. The twitching of one muscle causes the hand to open and the twitching of another muscle causes it to close. A quick flexing of respective muscles causes the hand to rotate one way or the other.

Acosta said learning to use the arm was relatively easy and only took a couple of weeks. Training begins with a computer program that uses myotraining and simulation software to virtually imitate the movement of the prosthetic hand.

"Before they even think about making you this," he says, motioning toward his prosthetic arm, "they train you on the computer. By the time you get this, you just put it on, and no problem."

Getting back to normal

Mac Lang, the clinical director and prosthetist of the Advanced Arm Dynamics Northwest Center of Excellence in Tigard, says the company exclusively specializes in upper limb prosthetics. And one of the things that sets the company apart from other prosthetic providers is its emphasis on long-term rehabilitation.

"We provide the prosthesis, but we also provide the rehabilitation for the patient to work that prosthesis into their everyday life," says Lang.

The clinic's occupational therapy room is equipped with various real-life objects which patients can train on to get used to using their limb.

"Something as simple as stacking cones may not be exciting or fun, and they often get tired of doing it here 100 times," Lang said. "Then they go out to Starbucks and have to pick up a cup of coffee and because they've done it here 100 times, it takes the anxiety away of having to do it in public in an uncontrolled setting."

Lang says a typical patient for them is one who, like Acosta, lost a limb in a job-related accident.

“We work with them to not only get back to the things they used to do at work, but return their life to normal as much as we can,” Lang says.

And toward that end, Advanced Arm Dynamics has a number of interchangeable attachments for its prosthetic arms.

Acosta’s natural-looking hand is what he uses when he’s out in the community, doing less rigorous activity. But the arm also comes with a couple of different “hooks” — one, a rectangular clamp-like device which is handy for picking up things like 2-by-4s, and another traditional looking hook, with a small pincer which is good for doing more intricate tasks.

He also has a more traditional body-powered, cable-driven prosthesis he may use when doing yard work.

“That mechanical arm is just much more durable and easier to maintain,” Lang says.

The arms are built in the center’s Tigard lab by Cullen Hays who has worked in prosthetics and robotics for about 12 years. He’s been with the Tigard center since it opened two years ago.

The lab fits and casts the form for the arm and then assembles the components to build the arms.

“The electronic components of the myoelectric arm, the wrist rotator, the electrodes, the electric wires — all of those we purchase from prosthetic manufacturers and assemble them into the custom limbs that we make,” Lang says.

And that technology is constantly evolving.

In fact, Acosta is already asking Lang about the time when he can get a fully articulated hand — one where the fingers have independent action.

“I’m looking forward to that one,” Acosta says with a smile, as he adjusts the skin on his left hand.

For more information about Advanced Arm Dynamics go to "[target="_blank">www.armdynamics.com](http://www.armdynamics.com).

Comments on returning troops...

Advanced Arm Dynamics’ Mac Lang spent two years at Walter Reed Army Medical Center working with veterans who were missing upper-body limbs. He says it gave him a deep appreciation for the military troops.

“My experience working with soldiers was incredibly rewarding,” Lang says. “They are an incredible set of patients to work with, because they’re so incredibly motivated.

“They are otherwise generally very healthy and active and in shape and were always trying to break the things that I gave them,” Lang adds. “They weren’t as accepting of some of what we thought was the status quo — what we thought they were able to do with prosthetics. They weren’t accepting of those limitations, so they were much more likely to use the things that we gave them in ways that we didn’t intend. That made us kind of push the envelope of what we thought was possible. It changed the way I look at patient care and what I thought was possible.

“Because of that, I started doing a lot of activity-specific devices. I’ve made people rock climbing arms, fly-fishing arms — strapping an ice axe on the end of a socket so a guy could climb up a rock wall,” Lang says. “A lot of things like that that I just didn’t think were otherwise possible.

“For those soldiers and service people coming back, I’d like to say two things,” Lang says. “One, is thank you for your service. But also, if you have had an injury or something like that, don’t let that be the defining portion of your service, or your life going forward. Don’t let that stop you. There are ways to get around not only an injury, but there are ways to get back to your life.”

Fast facts

- Myoelectric arms — depending on the components and level of amputation — can cost anywhere in the neighborhood of \$30,000 to \$150,000, according to Mac Lang.

- Advanced Arm Dynamics is a nationwide company with centers of excellence, besides the Tigard center, in Irving, Texas, Waterloo, Iowa, and will soon open centers in Minneapolis, Minn., and Philadelphia, Pa.

- The corporate entity, Advanced Arm Dynamics Inc., in Redondo Beach, Calif. — which offers the support for all of the different centers — also has the contract with Walter Reed Army Medical Center in Washington, D.C., to provide all the upper limb prosthetics for the service people coming back from Iraq and Afghanistan.

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