Studies show Bixeps machine developed here improves muscle strength in seniors

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(From right) NUS Associate Professor Alfredo Franco-Obregon, the primary researcher behind the Bixeps machine, with orthopaedic surgeon Tay Boon Keng, community volunteer Beatrice Chen and Prof Tay's patient, Mrs Louisa Chen. The 82-year-old, who uses the machine, used to struggle to stand up but can now do so without difficulty. ST PHOTO: LIM YAOHUI

Madam Chia Lu Ting, 71, was wheelchair-bound after being badly injured in a fall in July. But her weekly use of the Bixeps machine at the Care Corner Senior Care Centre in Toa Payoh East had her back on her feet within three months.

All she had to do was to put one leg into the machine for 10 minutes on a weekly basis.

"I'm very happy. I now have no problems with the 15- to 20-minute walk home from the centre," said Madam Chia, who suffered severe bruising but no fractures from the fall.

She is one of the many seniors going to about 30 care centres here who have access to the Bixeps machine, which has been shown to improve muscle mass in older people who are too weak or frail to do vigorous exercise. Most of these centres do not charge clients for the use of the machine, which forms part of their caregiving.

The machine, which was developed in Singapore, uses low-energy magnetic fields to stimulate cells in the muscles, strengthening them.

Although only the leg is inserted into the machine, the benefit extends throughout the body, said Associate Professor Alfredo Franco-Obregon of the National University of Singapore (NUS), the primary researcher behind the machine.

He started work on the machine at ETH Zurich, a Swiss university, and finished it at NUS. He and cardiac surgeon C.N. Lee – the man who got him to join NUS – are two of the owners of QuantumTx, the company hived off to commercialise the Bixeps machine. The patent belongs to the university.

Ms Mary Wee, who heads the centre that Madam Chia goes to, said most of the seniors at the centre are aged 75 to 95.

"I noticed their walking patterns were unsteady, and they were at high risk of falls. I wanted to do something to help them."

She had heard of community studies of the machine and was impressed with the reported results – better mobility and balance, and less pain after 10 weeks. There have been several such studies, starting with 90 seniors in 2019.

So, Ms Wee wrote a paper to the Community Silver Trust and received its dollar-for-dollar donation matching grant from the Government to buy a Bixeps machine, which costs more than $42,000.

The trust, which comes under the Agency for Integrated Care, has sponsored such machines for care centres run by three organisations.

Besides Care Corner Singapore, the other two are St Andrew's Mission Hospital and AWWA.

Bixeps simulates the effects of exercise by activating and stimulating mitochondria – the energy-making part of cells in the body – with the use of magnetic pulses.

The stimulated mitochondria produce energy that triggers a metabolic response in the cells, causing myokines to be released into the bloodstream and carried throughout the body. Myokines aid the regeneration of muscles, as well as regulate the body's organs.

There have been more than half a dozen community studies showing the benefits of the machine.

Prof Franco-Obregon said more than four in five people showed significant improvement after a couple of months, but a small number did not seem to benefit.

The latest verification of Bixeps' claims came from a clinical trial by the Chinese University of Hong Kong and the Prince of Wales Hospital in Hong Kong. The results of the study were published in the Frontiers in Medicine journal in October.

The double-blind eight-week clinical trial involved 60 patients suffering from end-stage knee osteoarthritis. All did a series of exercises and spent two 10-minute sessions on the machine.

For the control group of 30 participants, the machine did not emit any electromagnetic waves.

Both groups showed improvement after eight weeks, but the improvement in knee muscle strength and reduction of pain in the 30 who were treated with the Bixeps machine were significantly superior to the control group.

Their ability to function and the reduction in pain was 20 per cent to 30 per cent more than in the control group.

The researchers said Bixeps offers a new way to replicate some of the metabolic effects on the body that usually happen during endurance exercise.

They concluded: "Early improvements in strength and function can set the stage for better long-term outcomes, potentially delaying the need for surgical interventions, such as total knee replacement."

For the past two years, Singapore General Hospital (SGH) orthopaedic surgeon Tay Boon Keng has been putting his patients who have osteoarthritis and sarcopaenia, which is age-related loss of muscle mass and strength, on the machine, which was offered by QuantumTX for trial.

With this non-invasive treatment, his patients appear to benefit with stronger muscles, as seen in the grip-strength test, he said.

"After surgery, if their muscles are weak, they might fall again, so it's important to strengthen their muscles."

He said more than 100 of his patients have used the machine and quite a few swear by it. At SGH, their treatment is only for four weeks. Those who want to continue need to pay for it at QuantumTX in Tiong Bahru, which charges $50 for a 10-minute session.

Earlier studies showed that the ideal treatment is 10 minutes, up to a maximum of three times a week. When done more frequently, the stimulation of the mitochondria weakens.

One of Professor Tay's patients, Mrs Louisa Chen, 82, used to struggle to stand up. After trying out the machine at SGH two years ago, she continued her rehabilitation at AWWA, which also has the machine. Now, she has no difficulty getting up.

QuantumTX has applied to both the Health Sciences Authority (HSA) and the US Food and Drug Administration for approval for its next-generation machine, which allows for adjustment of signal strength so healthcare professionals can adjust it to suit the frailty of patients.

The current machine is sold as a wellness machine and does not require approval from health regulatory bodies.

Prof Tay said, once approved by the HSA, he would urge the hospital to acquire several Bixeps machines so patients undergoing physiotherapy can benefit from it.

However, the researchers are now finding that the benefits of using the machine extend beyond just increasing muscle strength.

Prof Tay said his patients have also shown higher bone density, since the myokines generated by the mitochondria are spread throughout the body.

Prof Franco-Obregon said NUS has also initiated two clinical trials of Bixeps for patients suffering from breast cancer and leukaemia, to see if it can reduce the inflammation that exacerbates these diseases. They also hope it can slow the cancer progression. He said the preliminary results are promising.

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