Depression can damage the brain

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People suffering from depression run the risk that their brains shrink and will remain smaller after the disease is over. The discovery provides new knowledge about the brain and new understanding of how antidepressants work.

A depression not only makes a person feel sad and dejected – it can also damage the brain permanently, so the person has difficulties remembering and concentrating once the disease is over. Up to 20 percent of depression patients never make a full recovery.

These are the conclusions of two projects conducted by Professor Poul Videbech, a specialist in psychiatry at the Centre for Psychiatric Research at Aarhus University Hospital.

In one of the projects he scanned the brains of people suffering from depression, and in the other he conducted a systematic review of all the scientific literature on the subject.

”My review shows that a depression leaves its mark on the brain as it results in a ten percent reduction of the hippocampus,” he says. ”In some cases, this reduction continues when the depression itself is over.”

Antidepressants can help

While depression can have serious consequences for the patient, Videbech says there is hope as the brain can be forced to heal itself in many cases.

Treatment with antidepressants and electroshock seem to be able to start the formation of new nerve cells, so areas that have shrunk can be built up again. Videbech expects that future studies will document the same effects with psychotherapy.

Studies at the Centre for Psychiatric Research, where people suffering from depression have been followed for more than ten years through brain scans, certainly show that shrinking of the hippocampus is reversible if the depression is treated.

Experience from own practice

Videbech started his studies after he had diagnosed and treated many depression patients at the hospital. A symptom typical of the disease is difficulty in concentrating and remembering.

But he discovered that the symptoms often continued when the patient had officially recovered.

”Their symptoms were very uncomfortable, at times crippling, and after I had heard the same story many times I started wondering about the cause,. So I started scanning their brains.”

The brain scans revealed intense activity in the hippocampus, which contains the memory function and

regulates the body’s various stress functions. The scans also showed that this area was often reduced considerably in depressive patients, especially if they had several long-lasting depressions. The worst cases were in patients whose depressions had not been treated.

Studied all the literature

The discovery came as something of a surprise, and Videbech thought that other researchers may have made the same discovery in recent years.

So he started to study many different scientific databases to find and read all previous studies on the subject. The correlation between depression and a reduction of the hippocampus appeared in report after report.

He concluded that when looking at people with depression as a group, there was, on average, a ten percent reduction of the hippocampus.

Stem cells form new nerve cells

One question that Videbech wanted an answer to was why some patients regain their previous ability to remember and concentrate after their depression was over.

His theory was that this was due to the brain’s plasticity – the brain can not only degrade itself, but also rebuild damaged brain tissue by forming new brain cells.

This ability to regenerate itself – neurogenesis – was discovered in 1996. Although the discovery is over a decade old, only a limited number of researchers know about it, he says.

Why neurogenesis only occurs in some people is not known, but it is believed that the process is started by stem cells in the hippocampus; these cells can divide and form new nerve cells.

In healthy people the two processes, degradation and regeneration, are constantly in balance. But some diseases, such as various forms of dementia and depression, lead to greater degradation than regeneration.

Animal trials have shown that neurogenesis is vital for making ’depressed’ rats healthy. The same applies to humans, says Videbech. Antidepressants and electroshock are effective ways of triggering neurogenesis.

Antidepressants influence neurogenesis

Comprehensive studies of the relevant literature show that antidepressants have a beneficial effect on depression, but the reason for this is not yet fully understood. This lack of knowledge has been used as an argument for not using this form of medicine. The neurogenesis theory can perhaps be a key to solving the problem.

"For many years, people thought that antidepressants worked primarily because they affected the neurotransmitter serotonin,” he says. ”But the latest research indicates that antidepressants influence neurogenesis by starting the formation of new nerve cells.”

He supports his theory by referring to trials with mice. A condition resembling depression is induced in the mice, so they get a characteristic behaviour pattern. The mice are then given antidepressants and start to behave normally again. If the mice are subjected to radiation, which is known to corrupt the formation of new nerve cells in the brain, the antidepressants suddenly stop working and the mice continue their ‘depressed’ behaviour.

A possible explanation is that the antidepressants started the formation of new nerve cells in the brains of the mice, says Videbech.

”This could indicate that treating depression medicinally triggers neurogenesis. Other treatments, such as electroshock and psychotherapy, appear to have the same effect.”

Videbech believes the idea of brain plasticity is very interesting and worthy of further research. ”But I also believe it is interesting that you can develop new forms of treatment that can lead to neurogenesis and prevent further degradation of nerve tissue and at the same time force the brain to repair itself,” he says.

This can be done with medicine and electroshock, but exercise also has a beneficial effect on the process.

”That’s why I always recommend my patients to exercise as hard as they can.”

Read the article in Danish at videnskab.dk [8]

Depression can cause some areas of the brain to shrink ? and the damage can last, even when the disease has stopped. (Photo: Colourbox) [9]
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Fact box

The Hippocampus (Latin, from the Greek for seahorse), is a convolution of the brain, located in the medial temporal lobe. The hippocampus is important for our short-term memory.

Fact box
Many studies show that electroshock therapy triggers neurogenesis. However, no studies have yet documented that psychotherapy triggers neurogenesis, but Poul Videbech is convinced that studies will demonstrate this. Countless studies document the beneficial effect that psychotherapy has on depression.

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Professor Poul Videbech

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