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Many lung cancer patients have trouble breathing – and if they can’t be cured, the struggle for air can become a relentless ordeal. Pulmonary stents – tubes inserted in the lung – can help. EU-funded researchers are taking this technique another step ahead with a new type of stent designed to improve and potentially extend the lives of people going through the final stages of the disease.

Breathlessness is a common symptom in lung cancer. In many cases, it is caused by a tumour growing in an airway or compressing it from outside. Stents inserted in the airway can help, but they have their limitations.

The PulmoStent improves on current products in a number of ways, says project coordinator Professor Stefan Jockenhövel of the Uniklinik RWTH Aachen’s Helmholtz Institute for Biomedical Engineering. This new device was designed by an EU-funded project of the same name specifically to help end-stage patients breathe more easily and carries a far lower risk of infection. It also stops the growth of tumours in the stented area.

The underlying concept could be adapted for a variety of applications, he adds – similar implants could, for example, be developed for use in the heart.

**An active bio-implant**

Pulmonary stents, says Jockenhövel, are usually made of metal mesh, sometimes covered with a layer of silicone. While they are very useful devices, they do present a number of problems.

In the case of mesh-only implants, he explains, tumours can grow right through the gaps and block the airway. If the mesh is covered with a layer of silicone to stall the tumour, it disrupts the function of the natural lining of the airway. More specifically, it obstructs the lining’s tiny, hair-like cilia, which can no longer fulfil their role of transporting mucus out of the lung, potentially causing a build-up in the stented area. And once the mucus starts accumulating, it can cause pneumonia.
The PulmoStent, Jockenhövel explains, was designed to address these issues. It is made of metal mesh covered in polyurethane and lined with a functional layer of cells to keep the mucus on the move. It also releases a drug that stops the tumour growing into the stent.

**Cell lining**

This layer of cells that covers the inside of the stent is one of the defining features of this innovation. This lining is grown from the patients’ own cells before the device is inserted in the lung.

Keeping these cells functional was a major challenge. The polyurethane-covered mesh serves as a barrier for the tumour, but it must let nutrients through for the cells inside. “We want the cells to survive, but we don’t want tumour cells growing in,” says Jockenhövel, adding that the partners have managed to tweak the porosity of the polyurethane to meet both objectives. They also found a way to insert the stent without damaging its lining of cells.

**Next steps**

By helping patients to breathe more easily, the PulmoStent could enable many to remain at home rather than in hospital throughout the final stages of the disease, without the need for frequent invasive treatment to keep airways open. As it reduces the risk of infection, this new device could also extend patients’ lives.

However, there is still a lot to do. After the project ends in March 2015, further testing and fine-tuning will be needed. Obtaining approval for use in clinical practice will be the next step and will also take time.

Jockenhövel expects the full process to require another three or four years and adds that the partners are determined to see it through together. “Our project addresses patients with an end-stage disease,” he notes. “Our aim is to make the life of these dying people as good as possible. That’s the most important thing.”

See also:  
CORDIS [3]

Project:  
Development & Evaluation of a Viable Stent Device for the Treatment of BronchoTracheal Cancer  
**Project Acronym:**  
PULMOSTENT  
**Project website:**  
**Contact:**  
Contact [4]

Source URL:  

Links  
[4] mailto:RTD-SUCCESS-STORIES@ec.europa.eu