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A very aggressive cancer defeated in three months

A team from UNIGE and HUG managed to save a woman whose aggressive cancer left her with only five months to live. This “miracle” highlights the importance of treatments based on immunotherapy.

The fight against cancer does not always end in victory. The main treatments today are surgical removal of the tumor, chemotherapy, radiation therapy and, to a lesser extent, stimulation of the immune system. A team from the University of Geneva (UNIGE) and the University Hospitals of Geneva (HUG) treated a patient who developed a tumor on the transplant kidney that she received nine years earlier. In this case, the cancer was very aggressive, leaving her with only five months of life expectancy. Specific to this case: the tumor originated from the donor’s kidney and not from the patient herself. This peculiarity enabled scientists to attack the tumor with a dramatic boost of her immune system, which saved her life. Now, seven years later, this woman is doing well and has no cancer recurrence. The results of this study, now published in the journal *Transplantation*, demonstrate the importance of the development of immunotherapy.

People with type 1 diabetes experience a major disruption of sugar absorption from the blood. Over time this condition affects various organs of the body, including the kidneys, eyes and the heart. “Kidney failure in diabetic patients is a recurrent problem, says Raphaël Meier, researcher at the Department of Surgery of the Faculty of Medicine of UNIGE and at HUG. When the kidneys are no longer doing their job properly, dialysis becomes mandatory, then a combined kidney and pancreas transplant allows them to improve quality of life.” Thanks to transplantation, patients no longer have to inject themselves with insulin every day, but they still have to take immunosuppressive medication for life so that their immune system does not reject the transplanted organs. “This results in an increased risk of contracting infections, or even developing tumors,” says the Geneva researcher.

A very aggressive cancer

A pre-dialysis diabetic woman since the age of 10 underwent a kidney-pancreas transplant at the age of 41 at HUG. The transplanted organs were from a 20-year-old male donor. “Everything went very well, his blood sugar and kidney function immediately stabilized and normalized,” recalls Raphael Meier. However, nine years later, during the annual check-up, the doctors noticed a lump in the kidney. They decide to have it operated on immediately and found a large tumor, with metastases that had already spread to the intestines, liver and lungs. “This type of tumor, called Bellini cancer, has a life expectancy of about five months with treatment, it is one of the most aggressive cancers,” says Raphael Meier.

Following the discovery of the tumor, a question arises: where does it come from? Is it a tumor developed by the patient herself, or is it a tumor that comes from the organ donor? To find out, the team of surgeons analyzes the genotype of the tumor. They discovered that



PET-CT-scanner showing the kidney tumour with liver and lung metastases (left, arrows). PET-CT-scanner after complete disappearance of the tumours at 6 months (right).

High resolution pictures

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the likely cause of the tumor was BK virus, which is also present in the metastases. They also found that the tumor contained Y chromosomes, therefore of male donor origin.

A triple attack by interleukin 2

Given the cause and the origine of the tumor, scientists relied on powerful treatment to try to save this woman. “We opted for interleukin 2. This treatment is based on a molecule which activates the immune system in an extreme way,” explains Raphaël Meier. However, this treatment is difficult to control, and the side effects are numerous and hard to tolerate for the patient, which is why it is not routinely prescribed. “This allowed us to carry out a triple attack which led to the destruction of the tumor,” he says. This treatment was particularly suited to this case, because the tumor did not come from the patient herself but from the donor. The boosted immune system attacked the non-self, tumor cells, very aggressively. In addition, anti-tumor Natural Killer cells were particularly active in this woman. Finally, with the cause of the tumor being of viral origin, the white blood cells specialized in eradicating viruses also kicked in.

For three months, the patient endured the treatment, so that six months later, there was no trace of the tumor and its metastases. “No longer being able to take her anti-rejection drugs, costed her her kidney and pancreas transplants, and the patient is on dialysis again. But now, seven years later, there is no trace of this aggressive cancer; a new transplant could now be considered,” Raphael Meier says.

Immunotherapy, the future of oncology treatments?

This case demonstrates the essential role of the immune system in the management of cancers. “The story of this woman showed us that there is always hope for a cure, even when it seems impossible. He underlines the courage of patients who are fighting to survive, and finally, he notes that research on immunotherapies must continue; the right angle of attack can allow our body to overcome tumors, and above all to prevent them from reappearing again years later,” concludes Raphael Meier.

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