

PROFESSOR VINCENT VIDAL - FAIREMBO PROJECT

« I'm a great believer in the serendipity of research. In all the projects I've worked on, it's always been discussions that have led me to think rather than scientific breakthroughs. And contrary to what I thought, ideas don't come when you're concentrating on trying to come up with good ideas. They come in moments of hesitation, in moments of sleep... And in the end, you realise that anyone can have these ideas. You realise that these are ideas that anyone can have, and that they come to people who want to accept them. The people who will realise these ideas, in my opinion, are the people who will have the opportunities to realise them. In other words, all practitioners and scientists will have more or less the same ideas at the same time. On the other hand, those who will have the opportunities to realise them will realise them. That's what makes the difference. »

Credits

Introduction

How do you make a scientific discovery? What paths must be taken, and what role do time and chance play?

"Dans les pas d'Archimède" is a series of podcasts from Aix-Marseille Université in which some of its most eminent researchers tell the story of a discovery they have made.parmi les plus éminents pour raconter l'histoire d'une découverte qu'ils ont faite.

In this episode, radiologist Vincent Vidal talks to us about his FairEmbo project, which promotes an innovative technique for stopping haemorrhage in developing countries.

Episode

My name is Vincent Vidal, I'm a professor of radiology at the APHM and professor of medicine at Aix-Marseille Université.

I lead the FairEmbo project, the aim of which is to replace the embolisation products used to block arteries with a product that is available throughout the world.

FairEmbo stands for 'fair embolisation', and it will help - and is already helping - to reduce mortality in emerging countries in the treatment of haemorrhage.

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Musical interlude

It all started 5 or 6 years ago. I was on a trip to Egypt, in Alexandria, with Professor Jafar Golzarian, an American radiologist of Iranian origin who lived in Iran until he was 18 and who has a real knowledge of the Middle East and the Near East.

We were at a conference together and we were discussing the problem of everything that is expensive in emerging countries, and he told me that he couldn't understand why they couldn't make a stent for 50 dollars.

A stent is a sort of small spring that is placed in the arteries, particularly in the heart and legs, to bring blood to a point where it can no longer flow. In these countries, a stent can cost 800, 900 or even 1000 dollars.

He has planted a small seed in my brain, but stents don't interest me much. I'm much more interested in embolisation products, i.e. products that block arteries to treat haemorrhages, but I was wondering whether we couldn't make a product that was cheap and available. This has real implications in these countries, because there are people who could benefit from treatment but who don't have access to it, not because the doctors aren't there but because the product isn't available.

Musical interlude

On the plane back - it was a night plane, I remember it well - I was still thinking about Jafar's phrase and the idea that we could make cheap products. It had become something of an obsession.

I started to get our team working on it in the laboratory, asking ourselves what we could use. Spontaneously, one night, I thought we could use cotton, because cotton, sterile cotton, is available all over the world, in every hospital. It seemed easy to use.

As I have the opportunity to carry out tests, in our laboratory at the AMU (Aix-Marseille Université), we carried out tests with cotton. It worked very well for blocking arteries, but on the other hand, it produced quite significant inflammatory reactions. Just as when you leave a compress in the body, what we call a textiloma, it causes inflammation... so it didn't work.

When an experiment doesn't work in the laboratory, which happens most often, it's interesting because it's not a hypothesis, it's a fact. You can't get round it and it teaches you a lot: what didn't work? What was the problem we didn't address from the start that would have prevented us from reaching this point? All these failures are always technical and technological breakthroughs, and that's where it's very important to put in place the collective brain, which we believe in so much in our team.

We have a room dedicated to this, a sort of think tank, with large whiteboards. We get together and think for 2-3 hours. We fill in the boards, take photos of them, erase them, fill them in again and erase them. And that's how we come up with solutions.

Who usually comes up with the solutions? It's the younger people, our interns. They are not formatted by conceptual ideas. They come up with new ideas, and they're usually the ones who come up with the best ideas. However, they don't have the background to take the idea all the way, so we have to be there to create the opportunities. This collective brain is very, very important. That's how we move forward.

Finally, we asked ourselves what could work in the same system, and we said to ourselves that if we used a product that had a cost, we would have the same distribution problems. Cotton was a good idea because we had some in our drawers. And, in fact, what else did we have in our drawers? Suture thread. It's everywhere, it's cheap and it's practically always sterile. There are absorbable and non-absorbable sutures.

Once again, thanks to the opportunities available to us, we carried out tests and realised that when bits of suture were placed in the arteries, they clumped together to form a plug. As we continued our research, we realised that today the materials used to block arteries include what are known as 'coils', which are small metal coils onto which manufacturers have placed small fibres to make them more thrombogenic, so that they occlude the arteries more quickly. But these fibres are made of polyamide, like sutures. In fact, doctors are already injecting sutures into patients "without knowing it"! So we remove the metal part and inject only the sutures. It works a little more slowly, but it works all the same.

When the tip of the catheter inside the body is in contact with the bleeding artery, we push in the embolisation material, for example a shape-memory metal wire. We take the suture out of its case, cut off pieces about a centimetre long and push them into the catheter with physiological saline. When they come out of the catheter, they'll get in the way of the lumen, the blood will pool on them and we'll be able to insert one, two, three or four of them, which will form a plug.

Musical interlude

Surgeons use millions, billions of sutures all the time, so this isn't a product you pull out of a hat. Around this table, almost all of us have sutures in our bodies.

Next, we have very clear pre-clinical methods that allow us to say whether or not it will work, whether or not it is effective. So we base our decisions on safety and efficacy.

Once we have that, we enter a clinical research model. In this case, it was used as a first-line treatment by countries that needed it. In Senegal, there aren't many interventional radiologists, but many have been trained by us and are technically very strong. But they have precisely this problem in hospital: patients who bleed but a lack of equipment.

They applied for authorisation to use suture and were able to treat the first patients and also produce international publications on the subject.

Beyond the use of the product, it develops everything else, because using sutures remains a plan B. Plan A would be to use the conventional products we have at home, but until they become available, plan B works very well. We're not here to say that we're bringing in a treatment that works less well: the treatment works just as well, but it remains a plan B because it's a little more complicated to use. Let's be very clear: we're not here to provide two-tier medicine. It's one-speed medicine, but with different equipment.

What we're also doing is demonstrating to the hospital community there that it's feasible. In other words, interventional radiology isn't expensive and it's easy to set up in these countries, but it needs to get off the ground. The local interventional radiologists are so motivated and so keen to work that they are developing all this.

For example, we currently have a radiologist from Chad working with us. She's the pioneer from Chad who came to us for training. She has seen a lot of vaginal haemorrhages. What is a delivery haemorrhage? It's when the uterus bleeds during childbirth. After childbirth, the uterus should contract, but in some women it does not, for various reasons. If it bleeds too much, the only solution left is to remove the uterus, and unfortunately there are cases of death.

So Amandine, this Chadian radiologist, has seen it all. She saw these women die. Delivery haemorrhage really is a terrible injustice. You prepare for the most beautiful event of all, the

birth of a child, and you end up with one or more orphans, a widower, grandparents who have lost their child. It takes three generations to recover from that.

Musical interlude

Our objective with FairEmbo, which is part of the A*midex Foundation at Aix-Marseille University, is both to conduct research and help countries to develop, and also to provide teaching. It's about having a fairly extensive network, knowing where there is a need for training in interventional radiology, so that we can offer it in France. For example, we have another radiologist from Chad and a radiologist from Benin arriving in November.

The aim is also for us to go to these countries, not at all to take the place of the doctors, but to support them, to help and increase the level of intervention. In Cameroon, for example, we're going to start interventional radiology. When we went there, we did some procedures, but we're going to be stepping up to increasingly complex interventions. Above all, we hope that health policy in these countries will realise that money needs to be invested in interventional radiology, and that once again, with relatively small investments, we'll be able to make giant leaps forward in healthcare.

At the moment, we have very little funding: we have no funding of our own, what we do have comes from donors and benefactors. In practical terms, what do we use it for? To welcome radiologists who come here for training. Overall, an intern's salary is €12,000 for 6 months, so we can pay salaries, or at least a sort of emolument. Then we have to finance the people we send over there, even if the costs aren't very high. And finally, there's the research, communication, e-learning and simulation part. We have simulators that we take to countries and leave there, so that we can see how operations are carried out. So any financial support we can provide is most welcome.

Musical interlude

What's complicated about research is that you doubt everything, and above all you doubt yourself. That's what limits us the most. When something doesn't work, you see the positive side of failure, which leads you on to something else, but it's difficult. You say to yourself "I'm taking 20 people with me, we're putting money into a project and if it doesn't work out, I'll take full responsibility". It's our job to take responsibility, but it's difficult not to be overwhelmed by doubt.

So you need a solid team around you, with highly motivated young people, because as we get older, we lose a bit of our energy. And then, above all, one thing that I think is very important is to share ideas. Obviously, you have to protect them, you have to have intellectual property, but you have to share a lot because when you're in a phase of doubt, you're dead on your own, you're going to go back into your shell. So sharing is essential.

We are incredibly lucky in France today. It's exciting to hold a professorship, with clinical work in the hospital and research at the university, because you're really at the heart of the matter, and you have a freedom of enterprise that's extremely important, and I'm very attached to it.

Conclusion

You have just listened to (or read) "Dans les Pas d'Archimède", the podcast series revealing the scientific discoveries of Aix-Marseille Université researchers.

This episode was recorded on the premises of the Aix-Marseille School of Journalism and Communication (EJCAM). It was written, directed and edited by Charlotte Henry de Villeneuve and Merry Royer. The music was composed by Hdv, who also handled the mix. Many thanks to Vincent Vidal for his contribution.

To find out more about the FairEmbo project and find all the useful links:
<https://www.univ-amu.fr/fr/public/chaire-fairembo>