Democratising PROTON THERAPY
CURRENTLY, CANCER IS TREATED IN THREE WAYS: medication, surgery and radiation therapy. Radiation is the most commonly used form of treatment – used either alone or in combination with the other two. Radiation is also considered as the cheapest way to treat cancer. In the US it is used in up to two-thirds of cancer cases, a number that goes down to a quarter in Asia due to the lack of equipment. The conventional way of treating cancer with radiotherapy is through x-ray accelerators, which accelerate photons, very light particles. These are targeted at the tumour. They hit the cancerous cells and damage the DNA strands of the tumour, which causes the death of the malignant cells. However, because of the way it is administered, the prolonged period of treatment, and the fact that the x-rays cross the whole body, conventional radiotherapy can cause damage to healthy tissue, and thus create side effects and other future problems for the patient. Further in some cancers, for example, prostate and breast cancers, the location of some tumours (potentially near the bladder and heart respectively) means that damage to vital organs is a real risk.

Proton beam therapy, by contrast, uses protons, and can deliver most of the radiation in the treatment to one spot, meaning it can target beams at individual tumours, and kill them, whilst sparing some 60% of healthy tissue, making it ideal for tumours that are hard to treat such as brain tumours and tumours in the head and neck.

However, proton beam therapy, in its current form, is also hugely expensive, meaning that it is unavailable to all but the wealthiest patients. It is also not widely available because the technology used to fire protons historically required a space with the footprint of a football pitch in order to operate safely – this is because the accelerator requires the building to be shielded from the radiation produced by the accelerator, and because the accelerators themselves used to be large, requiring a space that reflects this. This is where Nicolas Serandour and Advanced Oncotherapy come in. Serandour is clear that the market is about to change, and this change will happen because they have developed a new kind of proton beam therapy system.

Serandour describes protons as acting almost as a grenade that will explode and release its killing energy where the grenade stops. Protons enter the patient’s body and at the end of the path, they deposit most of their energy on a spot called Bragg peak. The level of energy provided to protons is set in a way that the Bragg peak is located exactly on the tumour. The current proton beam therapy accelerators use a circular motion to accelerate protons to a constant and maximal energy. So the energy of protons needs to be managed and reduced by radiation absorbers at the point where protons exit the accelerator. Serandour argues that these accelerators are extremely inefficient because so many protons are lost especially at low energies, that they make the cyclotron radioactive, hence why large radiation shielding is needed in the room housing the equipment (sometimes up to 6–8 metres thick).

The systems developed by Advanced Oncotherapy, after decades of work at CERN, have a smaller footprint and – importantly – accelerate protons in a straight line. This means that the energy of each pulse of protons can be controlled electronically without absorbers. This almost immediately removes many of the technical restraints on treatment centres, and, rather than requiring their own space in which to operate, Advanced Oncotherapy’s systems can be installed in existing buildings. Obviously, some shielding is needed, but nothing like the sort of shielding that is required in the custom-built buildings that house the older and circular proton beam therapy accelerators, all of which opens the possibility for these systems to be far more widely available than their older counterparts.

As a result of their smaller footprint, their modularity and the way they operate, the new systems are significantly cheaper to install and operate, meaning that the potential for them to operate at a similar cost...
to existing radiotherapy accelerator is tantalisingly close. Advanced Oncotherapy have already announced three new collaboration agreements for the systems to be operated in Harley Street in London by the London Clinic (the building costs here were about £10 million, compared to the c.£100 million budgeted by the Department of Health for the centre in London equipped with a circular accelerator), the University Hospitals Birmingham NHS Foundation Trust, and the Mediterranean Hospital in Cyprus. And they look set to keep expanding the availability of their systems.

Serandour is passionate about the potential for these new systems, pointing out that today there are only about 90 proton centres in the world, each offering between one to five treatment rooms. This equates to approximately 230 treatment rooms, serving c.70,000 patients a year. He points out that if only 20% of the people who potentially need radiation therapy were to receive proton beam therapy, then more than 10,000 treatment rooms for the therapy would be needed.

Of course, Serandour is the CEO of a successful business, and that business needs to make a profit. His vision is to work alongside hospitals and align interests. To do so, Advanced Oncotherapy work by installing their systems and receiving a share of the revenue received by the operators when they are up and running. He wants to work closely with hospitals and provide a turnkey solution – he feels that all stakeholders – the patients, the hospitals and the company have much more to gain if Advanced Oncotherapy help with and manage the projects that their systems are involved in. He emphasises that providing a turnkey solution needs to encompass all the aspects of setting up a proton centre, including the purchase of the system but also assisting customers with the building planning and construction and then linking different skills and freeing the client up to treat their patients. He describes the way they work as similar to a lifts manufacturer – where it’s not enough to just sell the machinery, you need to provide long term maintenance and support– this not only ensures future returns but also protects the future of the systems and build a long-term, diversified and sustainable platform.

For Serandour, although he inevitably has to focus on the bottom line, the systems are also about the hope that they offer. He is keen to emphasise the benefits of this therapy and highlight that many of the hardest forms of cancer to treat – such as tumours in the lung, liver or pancreas – will be soon more easily treated with radiation and proton beam therapy. Proton beam therapy has also had some incredible successes in treating some forms of childhood cancer – particularly brain tumours. He explains that radiotherapy's side effects can be particularly damaging to children, and that therefore proton beam therapy offers a safer and much more effective treatment for them. This is another area where he is passionate about the effect that the Advanced Oncotherapy systems can have socially. He explains that currently, because it is so expensive, proton beam therapy tends to only be accessible to those who are older and therefore more likely to have the money to pay for it. He describes the Advanced Oncotherapy systems as democratising cancer treatment and making it available to people who would not normally be able to afford it. He feels that children should be the primary beneficiary of this therapy and they can do this by reducing the cost to them. As a result, Advanced Oncotherapy are working to establish a programme which offers the therapy to children in the catchment area at cost, Serandour says simply: “we feel this is the right thing to do.”

Possibly the most exciting development today in the proton therapy world, and for the future of cancer care in general, is called FLASH Treatment. Whereas, usually, radiation therapy involves multiple appointments and several doses of radiation, Advanced Oncotherapy's systems, and their ability to concentrate and target protons at a tumour,
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have the potential to one day treat a tumour in just one treatment. Serandour describes this as a “huge opportunity” – it will not only revolutionise cancer treatment, but it will make patients’ lives so much easier, reducing appointment times and tiredness for the patient and also meaning the hospitals can be more efficient and treat more patients.

Of course, working in an industry that revolves around such a devastating illness can take its toll, but Serandour explains that working in this area is very rewarding. He describes the company he leads as staffed by people who are all invested in the systems they produce and are proud of the results that they are achieving and the hugely positive effects that they have on people’s health. He is proud of the fact that Advanced Oncotherapy is having a clear social impact. His hopes for the future of the systems are high; in ten years’ time he’d like to see them in the same sort of use as MRI scanners are today – a normal part of hospital life.

Serandour describes his goal as “to democratise proton therapy” and it looks like, with his sound business sense and his deep commitment to his company that he will do just that. It doesn’t feel like an understatement to say he is a man who is, very politely, leading a revolution in cancer treatment.

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