

Our Life through Device

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The last fifteen years... maybe twenty. If you drive and you approach the crossing corner, at least one passes in front of you looking attentively in his/her smartphone. You travel by train. Nobody is looking to the landscape. Everybody is playing on his/her tablet. Life through device. Farewell, real life!

Then it is normal that life preserved by medicine is more and more preserved by devices. The problem is to figure out what is the proportion in which therapy is delivered by devices instead of surgery or tablets. And another important problem – how much training it needs and how device therapy becomes a science *per se*.

I will try to check two specialities for device-based treatments – cardiology and neurology. Let us remember that there are at least 30 medical specialities and each of them is using some devices for therapeutic and diagnostic purposes.

What links cardiology most tightly to neurology is vascular involvement – which also pro-

duces pathology in any other territories – upper limbs, legs, mesenteric territory, renal vessels and the whole aorta pathology. Everywhere in these territories, stents are used – starting with bare metal, continuing with drug eluting stents, covered stents and now with resorbable scaffolds. Sometimes, someone has several stents on one single vessel – means he or she lives, for instance, simply with a metal coronary artery. We have also managed to implant portions of plastic aorta – but unfortunately, to date, we did not succeed in replacing smaller diameter vessels with plastic – these still develop trombi, which cannot be managed.

We also use coils to close unwanted aneurysms or fistulae in vascular pathology, and umbrellas or other devices in the very complex and various pathology of congenital heart and vessel disease.

We largely use devices in electrophysiology, starting with pacemakers and continuing with implanted defibrillators. We also use energy to ablate anything unwanted – ectopies or pathological electric circuits – as well as resynchronisation of ventricular contraction to restore their pumping force.

Speaking of heart failure, here the progress is outstanding. We currently use implanted left ventricular assist devices, right ventricular assist devices or both. Their energy consumption is minimal, because they rotate in a magnetic field with no friction, except that with the blood. The batteries are kept at the belt and may be recharged in a room with transmit resonators which charge the batteries wireless through the receiving resonators of the patient.

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These ventricular assist devices may be used as bridge to transplant, but already they are used as destination therapy, with several years of successful functioning.

The left or right assist devices are so small, that soon they will be implanted not surgically, but by interventional cardiology, as they are today only experimentally. The whole artificial heart to be implanted is also constructed – not yet for daily use in humans.

Valvular pathology is also treated by devices. TAVR or TAVI (Trans Aortic Valvular Replacement or Intervention) is currently used on hundreds – probably even thousands – of fragile patients with severe aortic stenosis. Severe mitral regurgitation may also be treated interventionally by the mitral clip.

In neurologic pathology, different pumps are used to deliver drugs on a very long term in disabling pathologies that until now have been considered not curable. For instance, such a pump may deliver intrathecal Levodopa in advanced Parkinson disease and also Baclofen intratecal for severe spasticity.

Deep Brain Stimulation (DBS) is used for advanced Parkinson disease, neuromuscular dystonias or essential tremor. Stimulation in the hippocampus is used in epilepsy but also for this illness vagal nerve stimulation. Spinal stimulation is also used for neuropathic pain.

Only the issues presented here for two medical specialties filled almost two pages. And we have only mentioned devices used for therapy, not those used for diagnosis as well. Knowledge about how to implant each device fills entire monographs and takes years of training. But without such devices, all the pathology we mentioned cannot be better cured or cannot be cured at all.

Let us imagine the years and years of imagination, passion and work it took the engineers who have designed and constructed such devices! Hats off and a deep bow of respect for their hard effort!

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