KALIOS, THE FIRST ADJUSTABLE MITRAL VALVE REPAIR DEVICE

Problem – Challenge
Mitral valve regurgitation is a progressive disease that prevents valve leaflets from closing properly. Over time, this leakage leads to heart failure. Mitral regurgitation or mitral insufficiency affects 8% of people aged over 65. The existing effective treatment consists in reshaping the valve annulus by implanting a Carpentier ring. This requires the surgeon to choose the ring size that best fits the valve. However, since this open-heart surgical procedure is performed under cardiopulmonary bypass, which is not a physiological condition, it is impossible to assess the quality of the mitral repair before the heart beats again. As a consequence, up to 30% of patients leave the operating room with some residual mitral regurgitation and up to 20% may need either medication or a second open-heart surgery within two years.

Solution
Initially designed by Prof. Tozzi in the Cardiac Surgery Department of the CHUV, the adjustable mitral ring “Kalios” was then developed with the support of the company Affluent Medical SA. This innovative device is to be implanted in open surgery with a technique very similar to that of the classical Carpentier ring. However, unlike a conventional ring, it always remains accessible after implantation so that adjustment of the ring shape can be performed. This invention offers the possibility of reshaping the mitral ring multiple times to optimize valve repair using a minimally invasive percutaneous approach within months following the surgery. Kalios is therefore aimed at improving the coaptation of mitral leaflets in order to correct residual and recurrent mitral regurgitations without further surgery. This procedure is considered a major advance in the non-invasive treatment of mitral insufficiency. Kalios was successfully implanted in five patients at the Vienna University Hospital (pilot study).

SUSTAINABLE “SWISS EBONY” FOR MUSICAL INSTRUMENTS

Problem – Challenge
Like many tropical wood types, ebony is an endangered species that is tricky to use, for instance, in instrument manufacturing. Despite strict trade regulations, ebony stocks are plummeting. Furthermore, ebony in musical instruments such as violins may only be imported into some of the 183 CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) countries if the legal provenance of the material in the finished product can be proven to customs authorities. Therefore, many musicians are reluctant to travel with their instruments as getting them through customs is quite risky. Numerous instruments have already been impounded. However, travelling isn’t the only problem. Anyone who deals in these instruments may be liable for prosecution if they are unable to prove the legal provenance of the material. Hence a substitute is urgently needed.

Solution
This is where the Empa and ETH spin-off “Swiss Wood Solutions” comes in. The start-up was founded by researchers from Empa and ETH Zurich. Its product, “Swiss Ebony”, consists of modified maple – a sustainable and entirely legal wood-based material. CEO Oliver Klausler and his team discovered a way to modify Swiss timber so it exhibits the properties of endangered tropical wood, which are crucial for instrument manufacturing. The ebony substitute can already match its natural role model in terms of quality and price. However, the researchers aim for a completely “green” production chain. The development conducted thus far was funded by grants from the Gebert Rüf Foundation, a grant from the Horizon2020 program, and the seed money from the co-founders. Moreover, the spin-off receives coaching from Empa’s business incubator glaTec, from the Suisse Innovation Agency Innosuisse, and from Venture Kick.

Violins
Photo: Wilhelm Geigenbau AG

Professionals of PQV playing on Swiss Ebony fittings
Photo: Empa

Master violin, equipped with Swiss Ebony line fittings (peg, fingerboard, tail piece, chin rest)
Photo: Empa