High-speed brushless motor enhances atherectomy procedures for medical device manufacturer

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Atherectomy procedures are one of the most effective ways to remove arterial plaque and improve patient blood flow. When a medical device OEM was searching for an alternative motor manufacturer for its atherectomy tool, it was vital that their new motion partner could optimise performance within the same form factor. With extensive experience providing motor solutions for handheld medical devices, Portescap was rapidly able to develop a customised solution, improving on the OEM's original requirements.

At least 2.6 million people in the UK have narrowing of the arteries around the heart, which can lead to a heart attack, angina, or both[1], while The American Heart Association estimates that over 16 million Americans suffer from coronary artery disease, described as the number one killer of men and women in the U.S.[2]. Build-up of fatty material in the arteries can cause them to narrow, in a condition known as atherosclerosis. Medical professionals say that an increased risk of suffering the condition is caused by ageing, high cholesterol and blood pressure, smoking, and as an inherited susceptibility[3].

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[1] https://www.bhf.org.uk/informationsupport/heart-matters-magazine/research/atherosclerosis#:~:text=At%20least%202.6%20million%20people,attack%2C%20angina%2C%20or%20both.

[2] https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronary-heart-disease

[3] https://www.nhs.uk/conditions/atherosclerosis/

A healthy lifestyle is recommended to minimise the onset of atherosclerosis[4]. However, for more severe cases, which can lead to the narrowing or blockage of arteries, restricting blood flow to various organs and tissues, the patient may have to undergo an atherectomy procedure. In this medical procedure, a thin tube is inserted into the affected artery through an incision in the skin. The tube features a grinder at its tip, and through a combination of centrifugal force and sanding, the fatty material, known as arterial calcium or plaque, is removed or modified within the artery. This procedure can also be combined with the insertion of a stent, that opens up and supports the artery, either to biodegrade over time, or remain within the patient.

High-speed operation

Crucial to the atherectomy device is the motion solution that drives the grinder. As a result of combined operational and commercial considerations, a large medical device manufacturer needed to replace its originally specified motor. Portescap's expertise in designing motion solutions for handheld medical devices enabled the rapid development of a drop-in solution.

To fit the existing motor's form factor and functionality requirements, the Portescap design team engaged with the medical device OEM. High motor speed was crucial for grinding optimisation, so the Portescap engineers specified a two-pole design in a brushless DC (BLDC) format. Along with the improved control offered by electronic commutation, the friction-free operation of the brushless motor enabled it to achieve a greater speed. With this in mind, the Portescap engineering team specified the Ultra EC ™-16ECS brushless DC motor design, able to meet the high-speed target at the required torque. The Ultra EC™ design also increased torque density and

[4] https://www.nhs.uk/conditions/atherosclerosis/

helped deliver the smooth control crucial to the precise requirements of the arterial procedure.

Given the compact size required for a hand-held device, the motor's heat efficiency was an additional factor to consider. The OEM specified a low motor operating temperature as surgeons need to hold the devices during the procedure. The frictionless operation of a slotless BLDC motor is enhanced by the Ultra EC™ 16ECS' low iron losses at high speed, achieved thanks to the motor's proprietary U coil technology. This efficient design allowed Portescap to meet the requirements of high speed while ensuring low operating temperature even within a compact package.

Rapid customisation

To ensure a fast and seamless integration with no OEM redesign required, Portescap's engineering team was able to customise the motor and provide an exact replacement in connections, as well as form factor. As a result of the new partnership, the medical device OEM has increased the performance and improved heat management of its atherectomy device, while maintaining the same compact dimensions and low weight. These improvements have helped to increase availability of the life-saving technology across new markets.

Image captions:

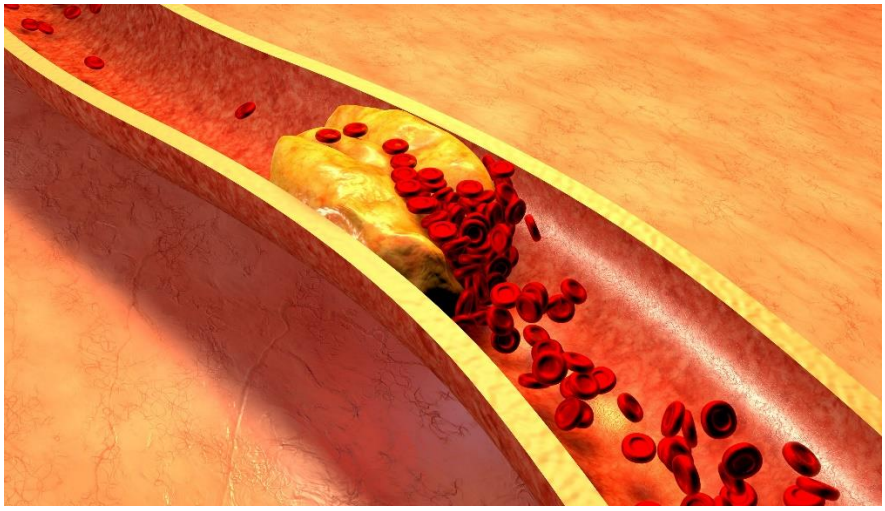

Image 1: Build-up of fatty material in the arteries can cause them to narrow or block, in a condition known as atherosclerosis (Source : AdobeStock_79614760)

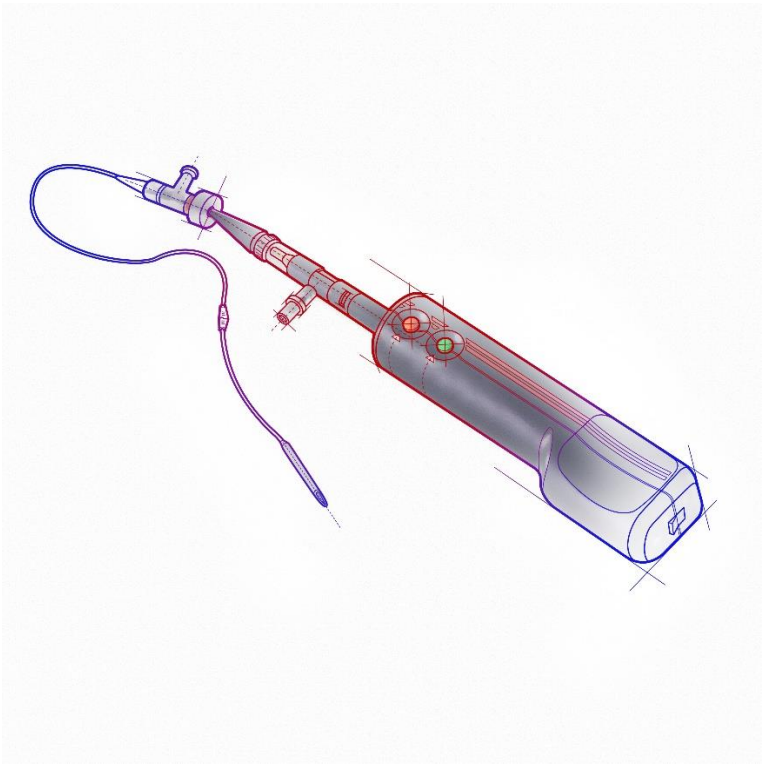

Image 2: Atherectomy device

Image 3: Portescap's Brushless Slotless Ultra 16ECS36 motor

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About Portescap

Portescap offers the broadest miniature and specialty motor products in the industry, encompassing coreless brush DC, brushless DC, stepper can stack, gearheads, digital linear actuators, and disc magnet technologies. Portescap products have been serving diverse motion control needs in wide spectrum of medical and industrial applications, lifescience, instrumentation, automation, aerospace and commercial applications, for more than 70 years.

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