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Slicing the LionHeart for assessment of pump shortening fraction after 1 year of follow-up[1]

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A 75-years-old outpatient who had received a permanent, fully implanted left ventricular assist system (LVAS: LionHeart, Arrow International, Reading, PA, USA) for destination therapy of his end stage (class IV) congestive heart failure, underwent planned control examinations at 12 months of follow-up including a multi-slice CT-scan. Fig. 1 shows the positions of the implanted LVAS with its subsystems. The LVAS slices shown in Fig. 2 allow for measurement of the pump shortening fraction (>80%). The device output (approx. 4.7 l/min) can be estimated by taking in account the pump stroke rate (approx. 90), which is derived from the uncompressed video 1[1]. Multi-slice CT examination allows for in vivo assessment of totally implanted ventricular assist systems and their function or malfunction (e.g. thrombus detection, etc.).

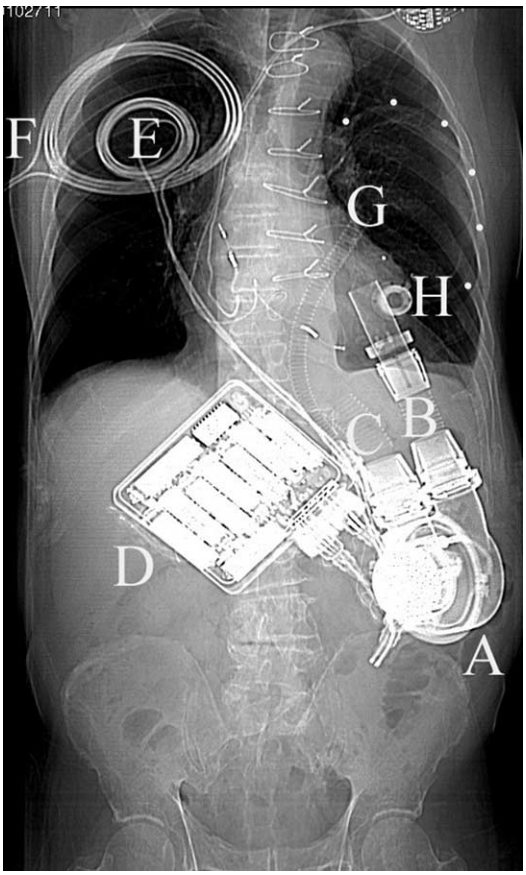

Fig. 1. Subsystems of the fully implanted LVAS including the blood pump (A) connected to the apex of the left ventricle (B) and the ascending aorta (C), the motor controller with the batteries (D) allowing the patient to be completely unthethered for about 20 min, the internal (E) and external (F) coils for transcutaneous energy transmission, the connecting line (G) between the blood pump housing and the compliance chamber (dots), and the access port (H) for volume adjustment of the latter.

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[1] See video 1 in the online version of this paper.

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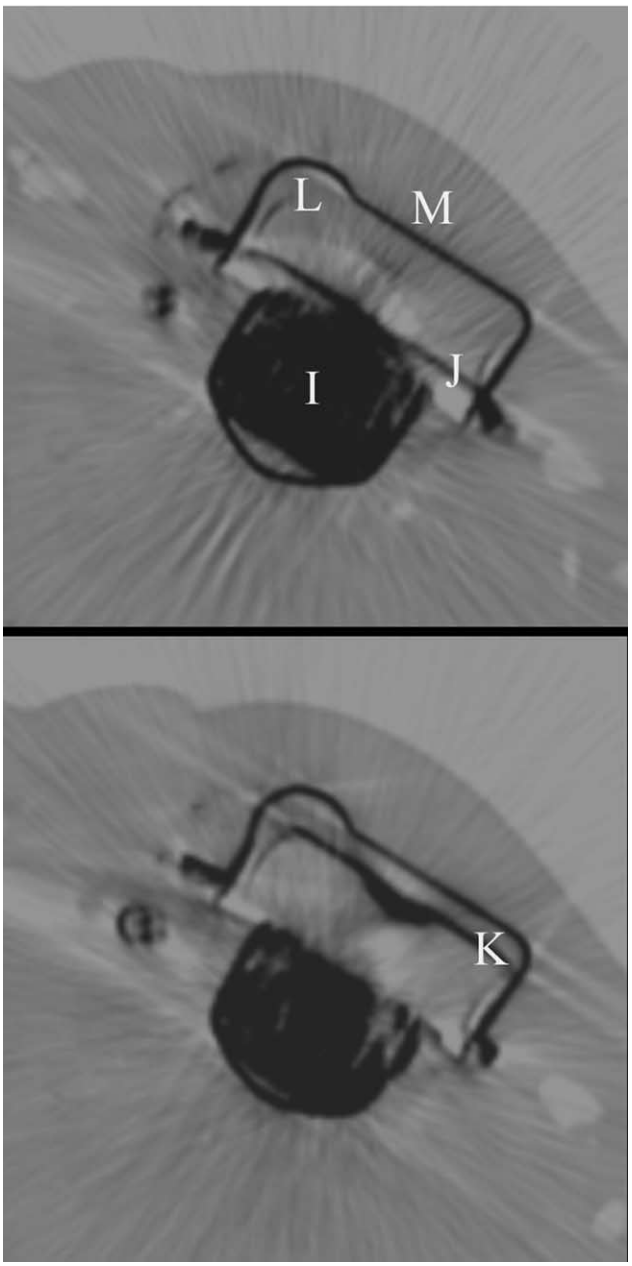

Fig. 2. LVAS blood pump slices are depicted with the motor (I), pusher plate in diastolic (J), and systolic position (K). Pump blood sac (L) compression can be derived from the pusher plate displacement, which provides a shortening fraction {[diastolic minus systolic distance between housing (M) and pusher plate] divided by [diastolic distance between housing and pusher plate]} of 0.83 or an ejection fraction equivalent of more than 80% (multi-slice CT).