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Alternative three-point lead configuration for successful external DC cardioversion in seven-feet-tall former basketball player

Short title: Alternative lead pattern for external DC cardioversion

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Direct current cardioversion (DCCV) is commonly used to restore sinus rhythm in patients with atrial fibrillation (AF). Unfortunately, it is still ineffective in up to 30% of patients. The outcome of the procedure can be affected by multiple factors including AF duration, position and size of electrodes, left atrial (LA) diameter, patient's body features and transthoracic impedance [1–3]. Although several modifications of standard DCCV were implemented to improve its effectiveness, including transoesophageal approach, vector-change and dual DC shocks [4–5], it still can be challenging in obese or extremely big individuals.

We present a case of a 41-year-old male, former professional basketball player, referred to our department for cardioversion of persistent symptomatic (EHRA 2a) AF after three unsuccessful DCCV attempts in the preceding three weeks. Patient was first diagnosed with paroxysmal AF in 2016, and since then was successfully cardioverted six times. From the time when he retired from professional basketball career, he gained weight, and at admission he presented with 136 kg and 213 cm height (BMI = 30). Written informed consent was obtained from the patient before the procedure. Transthoracic echocardiography revealed enlarged LA (4.7 cm) and normal LV ejection fraction (66%). The patient was anticoagulated with rivaroxaban 20 mg

QD, and subsequent transoesophageal echocardiography revealed no intracardiac thrombi.

Considering the previous unsuccessful DCCV attempts — despite the use of both classical antero-lateral and changed-vector antero-posterior lead configuration, combined with manual pads compression and 360 J maximum energy — we decided to switch to an ad-hoc modified three-point lead arrangement, being in fact a combination of the two mentioned configurations. Zoll M-series biphasic external defibrillator (Zoll, Chelmsford, MA, US) with dedicated adhesive external patches was used. Anterior electrode was placed in the right parasternal line just below the clavicle, posterior electrode was positioned on the back in the left paraspinal line on the Th4-Th6 level between the vertebrae and the scapula; the lateral electrode was placed in the apical region (Figure 1A and 1B). The connectors were cut off and insulation was removed from the distal parts of the wires. Then wires of the posterior and the apex electrode were electrically connected by twisting together and clamping with pean forceps. The anterior electrode's wire was likewise connected to another surgical instrument. Both instruments, considered now as the electrodes/poles were placed on the electrically insulated table at the bedside (Figure 1C). In deep sedation (140 mg propofol iv) the defibrillator's paddles were placed over the forceps and 360 J DC shock was applied, restoring the sinus rhythm.

With a standard DCCV, the current density in the heart tissue is similar in both recommended configurations: antero-lateral and antero-posterior (Figure 1 D and 1E). With the anterior pad left in position and the other split equally to lateral and posterior location (Figure 1F), both vector modification and possibly the increase of current density in the atria can be achieved. The proposed three-point DCCV can be effective when the standard approach fails to restore the sinus rhythm.

Article information

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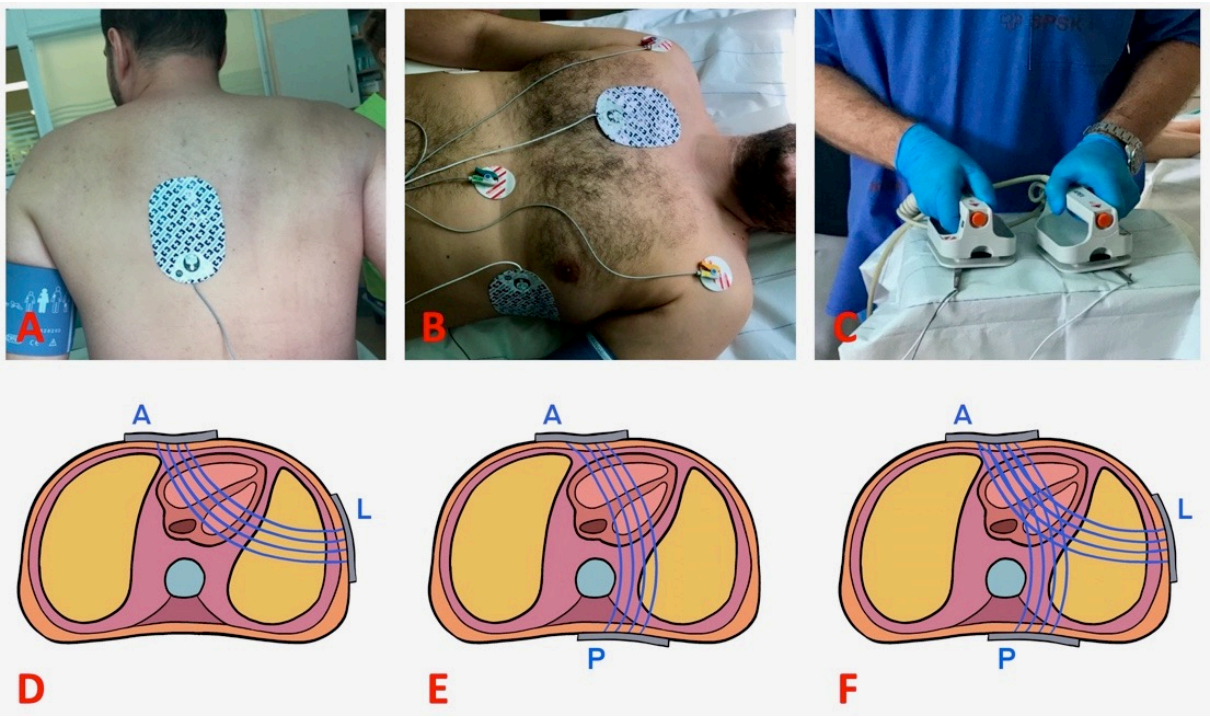

Figure 1. Ad-hoc modified three-lead configuration for external DC cardioversion (panels **A-C**) and different current vectors and density during altered lead configuration for external DC cardioversion: antero-lateral (panel **D**), antero-posterior (panel **E**) and split antero-postero-lateral (panel **F**)