Transvenous lead extraction: Can it be simple yet safe?

The clinical need for lead extraction procedures has increased in recent years. Increasing device implant rates are related to a subsequent need for repeated generator replacements, lead revisions, and system upgrades. These, in turn, have collectively led to a respective rise in the rates of systemic infections and other lead-related problems which may mandate lead extraction. Traditionally, lead extraction procedures encompass clinical challenges and risks which dictate careful pre-procedure planning within a multi-disciplinary team (1). Factors thought to preclude a straightforward extraction procedure are a prolonged length of time since the initial lead implantation, the presence of defibrillator leads, female gender, old age, left ventricular dysfunction, systemic infection, a poor overall clinical status of the patient, and significant co-morbidities (2). Fibrous adhesions preferentially develop in the venous insertion site, the subclavian vein, the superior vena cava and the tip-endocardial interface (3, 4). These areas are particularly prone to damage during an extraction procedure, which can then lead to catastrophic complications, even in the hands of the most experienced operators.

Extraction procedures are performed in the cardiac electrophysiology/catheterization laboratory, in the operating theatre, or in a hybrid laboratory. Under all circumstances, it is imperative that onsite cardiothoracic surgical backup and anesthetic cover is available. The Heart Rhythm Society consensus statement on lead extraction procedures highlights the importance of establishing a robust clinical indication for lead extraction prior to the procedure. A confirmation that the clinical risk deriving from leaving the existing leads in situ is indeed higher than the risk of the extraction procedure per se, is essential to justify the rationale for proceeding to an extraction procedure (5). The majority of lead extractions are performed via the transvenous approach, although open chest extraction may be required in specific cases (6).

Tools and techniques utilized for lead extractions typically range from simple traction with regular stylets to locking stylets (7), telescoping sheaths, and more advanced technologies, such as powered mechanical sheaths, namely operating with radiofrequency, manual rotational force, or laser energy. The latter, sophisticated methods, laser extraction in particular, are associated with higher procedural success, greater time-efficiency, and an equal safety profile (8, 9). One should not disregard, however, the financial constraints which may inhibit a more widespread use of powered mechanical sheaths for lead extraction procedures. In the modern era of increased cost-awareness, the routine use of cutting-edge, yet costly modalities may be prohibitive, especially in certain countries with limited resources. In this context, the need for clinically efficient, cost-effective means of lead extraction that do not compromise patient safety is particularly timely and relevant.

In this issue of the Anatolian Journal of Cardiology, an article entitled "Cardiac implantable electronic device lead extraction with use of the lead-locking device (LLD) system: keeping it simple, safe and inexpensive with mechanical tools and local anaesthesia," Manolis et al. (10) report a single-center experience on the use of an LLD for lead extraction procedures. Over a 10-year period, the use of LLDs was required in 92 of 98 leads and yielded a procedural success of 98%, while it was supplemented with the use of telescopic sheaths in 28% of patients. No major complications were recorded.

The results of this study are encouraging, but have to be interpreted in the appropriate context. Clearly, patient safety is the first clinical priority, and should overcome any financial aspects relating to procedural costs. On the other hand, the availability of adequate resources and staff training to employ more advanced technologies may simply not exist in some countries, and a referral to a foreign center may not be straightforward. It is important to recognize that an extraction procedure may be feasible with the use of more conventional tools which mitigate not only clinical risks but also costs. However, it is equally critical to be able to identify the subset of patients at high-risk for procedural complications during a lead extraction procedure, who will benefit from being referred to a high-volume center where the most contemporary facilities are available. Therefore, the development of clinical scores to enable an accurate risk-stratification of a patient requiring a lead extraction procedure is of utmost importance. The Lead Extraction Difficulty (LED) score was developed for this purpose and is defined as: number of extracted leads within a procedure + lead age (years from implant) + 1 if dual-coil – 1 if vegetation. An LED score greater than 10 could predict a complex procedure (i.e., with increased fluoroscopy time) with a sensitivity of 78.3% and a specificity of 76.7 % (11). More recently, a new risk score model named IKAR (I=infective indications, K=kidney dysfunction, A=age ≥56, R=removal of high voltage lead) was published. Patients with IKAR score ≥3 points exhibited 79% mortality, as compared with 16% in patients with a score of 1–2 (12).

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Accepted Date: 12.07.2017

DOI:10.14744/AnatolJCardiol.2017.25858

Lead extraction procedures are possible nowadays with a discernible but limited number of risks. Notwithstanding the considerable progress achieved, lead extraction still remains a high-risk procedure, and should only be performed in appropriate centers. A uniform classification scheme of outcomes and quality measures is essential for the meaningful evaluation of results reported in different studies. Prospective multicenter registries are reasonably expected to provide additional insights with regard to standard management strategies as well as short- and long-term outcomes (13).

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