

SCIENTIFIC LETTER

Determinants of procedural outcome of chronically implanted pacemaker and defibrillator leads using the Excimer laser sheath

C A Rinaldi, J Bostock, N Patel, C A Bucknall

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The extraction of chronic pacemaker and internal cardioverter defibrillator leads is performed for a number of reasons including chronic infection, lead dysfunction, and venous obstruction. Traditionally leads were removed by traction which is associated with a high incidence of failure and serious complications. This has led to the introduction of laser lead extraction (LLE) which is a safe and reliable method with a success rate of over 90%.¹ We prospectively examined the procedural success and safety of LLE over a two year period in our institution. We also examined whether procedural outcome could be predicted by baseline variables.

METHODS

All patients gave full written informed consent for extraction procedures. LLE was performed if simple traction had failed. Fluoroscopy was used to monitor all transvenous manoeuvres. LLE was performed using previously described techniques¹ with a Spectranetics Model CVX-300 Excimer Laser System (Spectranetics, Colorado Springs, USA) in combination with a Spectranetic laser sheath and a Cook Byrd Dilator Sheath stylet (Cook Vascular, Leechburg, Pennsylvania, USA). The device uses pulsed laser light from a xenon chloride laser to core the fibrotic tissue growth over the lead and free it from the vascular space. Success with the laser sheath was defined as complete extraction of the targeted lead via the superior vena cava approach in the absence of serious adverse events. If LLE was unsuccessful we performed basket retrieval via the femoral approach.

RESULTS

LLE was performed in 80 patients over a period from May 1998 to March 2001 (table 1). Patients were predominantly male (73%). A total of 117 leads were extracted and of those extracted 107 required LLE (91%). In all 80 patients LLE was required for at least one lead; in 47 for one lead, in 29 for two leads, and in four patients for three leads. The mean (SD) time from implant to explant was 2772 (1732) days. The most common reason for explant was system infection occurring in nearly half of cases (44%); the remaining leads were removed for dysfunction, suspected J wire fracture, discomfort, venous obstruction or to facilitate new systems. Six defibrillator leads were extracted (three due to lead fracture, one each for lead upgrade, infection, and venous obstruction). All defibrillator leads were successfully removed but one required femoral basket retrieval. Procedural screening time was 986 (999) seconds. Complete success was achieved in 74 cases (93%). In the remaining cases femoral basket retrieval was required in 5 (6%). One death occurred several days following the procedure (1%). Screening time positively correlated with the duration of time from implant to explant ($p = 0.01$), the number of leads extracted ($p = 0.02$), and the number of leads lasered ($p = 0.003$). Screening time was prolonged with younger age ($p = 0.003$). There was no difference in procedure time depending on the explant reason ($p = \text{NS}$). An initial decrease in screening time occurred after the first three months of

Table 1 Procedural variables and outcome in 80 patients

Procedural variables (mean (SD))	
Time from implant to explant (days)	2772 (1732)
Range	226-7665
Screening time (secs)	986 (999)
Range	20-5689
Lasering time (secs)	72.4 (48)
Range	8-190
Radiation dose (cGycm ²)	1457 (1337)
Outcome (patients (%))	
Complete success with laser sheath	74/80 (93%)
Failure (requirement for use of IVC approach)	5/80 (6%)
Partial success	1/80 (1%)
Complications (number)	
Tip of lead left	6
Lead tip embolisation	1
Pulmonary emboli	1
Death	1

experience with LLE, but this subsequently increased reflecting an increase case complexity.

DISCUSSION

Our results compare favourably with previous studies. In the PLEXES (pacing lead extraction with the Excimer sheath) trial (465 leads in 301 patients) LLE had a 94% success rate compared to 64% in the non laser group.¹ Epstein and colleagues reported a 92% success rate for LLE of 1285 leads in 863 patients in 52 centres.² Kennergren reported a 94% success rate of LLE for 50 leads (45 patients) in one institution.³ Our data represent a typical group undergoing extraction with the majority of patients undergoing extraction for infection. Our data show that procedural outcomes are related to certain baseline variables. The increased screening time with longer implant duration would be consistent with increasing fibrosis around the lead. The reason for increased screening times with decreasing age is unclear, but may be related to the fact that younger patients tended to have more complex pacing systems. The demonstration of an initial decrease in screening times is likely to represent a learning curve. The subsequent increase in screening (screening times after 18 months were similar to initial screening times) would appear to relate to an increase in case complexity (more than two leads/ICD leads) as experience with the technique increased.

Our data demonstrate that LLE in our institution is effective and safe with a 93% success rate and a small incidence of failure and complications. Our data add important findings in the determinants of procedural variables; importantly, success appears to be unaffected by explant reason. LLE is, however, a specialised technique with a significant learning curve⁴ and

should only be undertaken by expertly trained practitioners in centres with experience of the procedure and on site facilities for emergency cardiac surgery. This is in keeping with recent North American Society of Pacing and Electrophysiology recommendations on pacemaker and implantable cardioverter-defibrillator lead extraction which call for a formalisation of the practice of lead removal.⁵

Authors' affiliations

C A Rinaldi, J Bostock, N Patel, C A Bucknall, Guys and St Thomas NHS Trust, St Thomas' Hospital, London SE1 7EH, UK

Correspondence to: Dr Christopher A Rinaldi, Cardiothoracic Centre, Guys and St Thomas NHS Trust, St Thomas' Hospital, Lambeth Palace Road, London SE1 7EH, UK; c.a.rinaldi@btinternet.com

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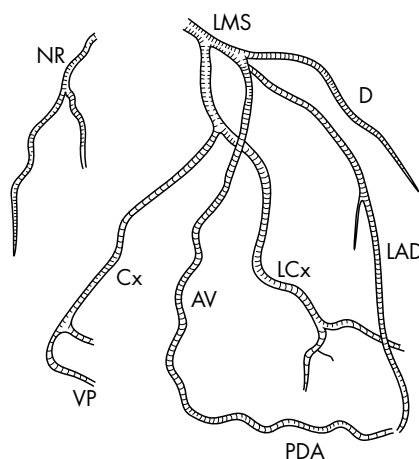
IMAGES IN CARDIOLOGY.....

Anomalous origin of the posterior descending artery from the left anterior descending coronary artery: cardiac surgeons beware

The unusual variant coronary anatomy of a 54 year old man with angina is illustrated here schematically and angiographically. The right coronary artery (NR) was non-dominant. The circumflex artery (Cx) continued along the atrioventricular groove giving off the lateral circumflex (LCx) before passing onto the inferior surface and terminating as a vestigial posterior descending artery (VP). An aberrant vessel (AV) arose from the left anterior descending (LAD) distal to the first diagonal (D). This aberrant vessel passed anterior to the root of the main pulmonary artery and the right ventricle to reach the acute margin of the heart before passing onto the inferior surface and terminating as the main posterior descending artery (PDA). There was a significant stenosis of the LAD beyond the origin of the aberrant vessel and the patient received a left internal mammary artery graft to the LAD. The operative appearance confirmed the interpretation of the anatomy.

There have been less than 10 reported cases of the right coronary artery arising from the LAD. In all of these the aberrant vessel passed anterior to the root of the pulmonary artery, but unlike the currently described case they all passed along the right atrioventricular groove and none had an identifiable right coronary ostium.

Cardiac surgeons need to recognise such variant anatomy to avoid damage of an aberrant vessel by vent placement, and also to avoid misidentifying the LAD as the vessel that is sited furthest to the left on the anterior surface of the heart.



L C H John
lindsay.john@kcl.ac.uk