Abstract—The subcutaneous implantable cardioverter-defibrillator (S-ICD) has proved to serve as a suitable alternative to the now commonplace transvenous implantable cardioverter-defibrillator (T-ICD), which has been confirmed to be a lifesaving device in patients suffering from sudden cardiac arrest and is currently in use in over a million patients.

I. INTRODUCTION

THE S-ICD system was pioneered by Cameron Health and was put into commercial use outside of the United States in early 2009. It is still awaiting FDA approval in the States, however an observational study has been conducted and the results seem quite promising for the future of the device. The S-ICD differs from conventional T-ICD systems by the lack of transvenous leads going into the heart. This is a breakthrough in defibrillation technology because it provides an alternative method of treatment for patients who are not eligible for or have experienced severe problems with T-ICD devices.

II. METHODS

The S-ICD consists of an electrically active pulse generator, which is implanted near the left mid-axillary line, and a subcutaneous lead, consisting of sensing electrodes and a shocking coil, which is tunneled 1 to 2 cm to the left of the midsternal line. The S-ICD has a lithium battery with a projected life of 5 years. Therapy consists of 80-Joule (J) biphasic transthoracic shocks and 30 seconds of post-shock pacing. Unfortunately, the S-ICD system is about twice as large as current T-ICD devices, and has a significantly shorter battery life. In addition, the S-ICD does not provide anti-tachycardia pacing (ATP), which means that if a patient is suffering VT they will receive a painful 80 J shock with the S-ICD, as opposed to painless ATP with a T-ICD. The last major drawback is that the S-ICD also does not provide bradycardia pacing.

III. RESULTS

Despite the aforementioned drawbacks, the S-ICD has shown to provide reliable conversion from VT/VF to sinus rhythm in both induced and spontaneous cases. The most recent observational study of 330 patients produced a 100% success rate in converting induced VT/VF to sinus rhythm. A total of 119 spontaneous VT/VF episodes in 21 patients were treated by the device during this same study, 38 of which were discrete. Of these 38 discrete incidents, 35 were converted to sinus rhythm with the first shock, and 37 out of the 38 corrected with one or more shocks. The one instance that was not converted spontaneously while the device was charging for a second shock. The remaining 81 episodes were storm events that occurred in four different series in two patients. Three out of the four events were ultimately terminated by the S-ICD system. One event required external defibrillation. Unintentional therapy occurred in 13.1% of patients over an 11-month follow-up.

In a separate study, two children aged 10 and 12 were implanted with S-ICD devices. The S-ICD was the device of choice in these children because they had sustained previous infections that could have compromised transvenous leads. Conventional T-ICD’s are commonly associated with a high risk of complications in children, and inappropriate shocks can occur as often as appropriate shocks. The S-ICD was implanted successfully in both boys and was found to be functional through series of induced VF episodes. Both boys remained well after an 8-month and 5-month check-up visit.

IV. CONCLUSION

Based on the research and clinical studies that have been conducted thus far the S-ICD shows promising signs of being a worthy alternative to T-ICD devices. The S-ICD eliminates the possibility of transvenous infection and could possibly produce fewer inappropriate shocks in children as compared to T-ICD’s. The FDA has yet to release a statement with its response to the most recent clinical study, however, it is very possible that the S-ICD will be available to consumers in the United States in a short matter of time if further tests and trials produce similar results.

REFERENCES