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EDITORIAL

Taurolidine: could this be the 'silver bullet' against cardiac implantable electronic device infection?

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This editorial refers to 'Use of a taurolidine containing antimicrobial wash to reduce cardiac implantable electronic device infection' by S. Borov *et al.*, https://doi.org/10.1093/europace/euad306.

Infection of cardiac implantable electronic devices (CIEDs) remains a persistent, clinically difficult, and expensive problem. Despite best practices, CIED pocket infection continues to occur with the resulting need for re-operation, prolonged antibiotic therapy, expensive wound care management, and of course the cost of a new device and implant. Although the development of pocket infections may occur months after the procedure, most infections occur in the early phase of healing.

The investigation by Borov *et al.*[1] in this issue of Heart Rhythm introduces us to a potential new preventative method to reduce the incidence of CIED pocket infection. Prior efforts using dilute povidone-iodine, hydrogen peroxide, and various antibiotics for pocket wash/irrigation have not shown consistent results relative to infection prevention. In the PADIT trial,[2] the use of antibiotic pocket wash along with a more intense antibiotic regimen including several days of oral antibiotic therapy was not proven to be better than a single pre-operative antibiotic given intravenously along with plain saline pocket irrigation.

In this paper, the investigators evaluated two groups of patients during any CIED procedure for treatment of the pocket and hardware with either hydrogen peroxide or taurolidine. The study was conducted over a 5-year period. Procedures included re-operations as well as device replacements and 'upgrades'. The primary endpoint was significant infection within 3 months of the procedure with a secondary endpoint of infection out to 1 year. The findings were significant in that none of the patients assigned to the taurolidine group had an infection during the 3-month post-procedure of their CIED despite the fact that this group had more risk factors for infection. The hydrogen peroxide group had a 1.1% ($n = 6$) infection rate, which is generally consistent with rates from other published registries and studies using standard of care implant techniques. On longer term follow-up to 12 months, three patients (0.46%) in the taurolidine group developed an infection, while an additional three patients (total of 1.63%) became infected in the hydrogen peroxide group.

Taurolidine (TauroPace™ TauroPharm, Waldbüttelbrunn, Germany) is a pharmaceutical that has been used on vascular catheters as an antimicrobial. According to the company,[3] it prevents the formation of biofilm and adhesion of bacteria and fungi on the surface of a medical device. It also causes direct disruption of bacterial and fungal cell walls as well as neutralizes endo and exotoxins. It is claimed to have strong activity against Staph (including methicillin resistant Staph aureus) and vancomycin resistant Staph aureus, as well as Gram negative bacteria and fungal organisms. It is not an antibiotic, and resistance has not been observed to date. Overall, it seems to be well tolerated and has minimal adverse events reported.

The fact that the infection rate with the taurolidine treatment was so low is promising. It is also important to note that there were no apparent adverse effects from the use of taurolidine in this study. The study data are weakened by the lack of randomization; however, the fact that there were zero infections noted in 654 procedures is impressive and intriguing. Clinicians have tried many strategies to minimize infection. The WRAP-IT[4] trial showed that the use of an absorbable antibiotic envelope containing rifampin and minocycline can reduce the rates of infection in higher risk patients and those undergoing repeat procedures. However, the cost of the envelope is high, and thus the routine use in all patients, especially those undergoing an initial procedure, may not be justified. In addition, there are many countries where the cost of an envelope is prohibitive and is simply not an option for patients.

This investigation opens the door on a potential new and hopefully cost-effective method to reduce the CIED infection. It certainly warrants a more robust and randomized trial. There is a registry in Europe (The European TauroPace Registry) that is enrolling patients to gain data from multiple centres and implanters. This should provide more data regarding effectiveness and any downside to the use of this agent. It would be nice to see a randomized trial comparing standard implant vs. the use of taurolidine; however, with generally low infection rates, the study would likely require a large population. If the observed infection rate of zero in the first 3

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months can be reproduced, then perhaps significant results would be found quickly. The one unknown at this time is the cost of the taurolidine, though I suspect it will be substantially less than that of the antibiotic envelope.

In addition to teaching and observing proper skin preparation and sterile technique, we need to continue to pursue different techniques, treatments, pharmaceuticals, and other options in search of the best combination of these to prevent as many infections as possible. Taurolidine may be one step closer to the 'Silver Bullet' that will kill the microbes, prevent CIED infection, and not affect the host.

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Data availability

There are no new data associated with this article.

References

1. Borov S, Baldauf B, Henke J, Pavaci H, Perani A, Zrenner B *et al.* Use of a taurolidine containing antimicrobial wash to reduce cardiac implantable electronic device infection. *Europace* 2023;**25**:euad306.
2. Krahn AD, Longtin Y, Philippon F, Birnie DH, Manlucu J, Angaran P *et al.* Prevention of arrhythmia device infection trial: the PADIT trial. *J Am Coll Cardiol* 2018;**72**:3098–109.
3. TauroPace.com.
4. Tarakji KG, Mittal S, Kennergren C, Corey R, Poole JE, Schloss E *et al.* Antibacterial envelope to prevent cardiac implantable device infection. *N Engl J Med* 2019;**380**: 1895–905.