

The Host Response: Toll Like Receptor Expression in Periprosthetic Tissues as a Biomarker for Deep Joint Infection

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Introduction: Accurately defining periprosthetic joint infection (PJI) is critical to patient care and outcomes; however, no gold standard for the diagnosis exists. Toll like receptors (TLRs) 1 and 6 are critical molecular elements of the host inflammatory response against bacterial infection. Our purpose was to determine whether TLR elevation in periprosthetic tissues can be detected as a biomarker specific for bacterial PJI.

Methods: Under an IRB approved protocol, 57 patients undergoing revision total hip and knee arthroplasty were prospectively evaluated for PJI according to currently recommended diagnostic criteria. 8 patients were excluded for insufficient workup and 7 for conflicting findings; of the 42 remaining, 17 were designated infected, 21 noninfected, and 4 persistently infected following antibiotic treatment. Periprosthetic tissues were collected intraoperatively and analyzed for expression of TLR1 and 6, as well as TLR 10 (as a tissue control) using real time polymerase chain reaction (PCR). Mean TLR expressions in infected and noninfected patients were compared using a student t test. Receiver operating characteristic curves, area under the curves (AUC), sensitivity, and specificity were calculated to determine the accuracy of each TLR for predicting PJI.

Results: TLR1 and 6 expression was significantly elevated in infected compared to noninfected samples ($p=0.0004$, $p=0.0049$), while TLR 10 was not ($p=0.8163$). AUCs were 0.995 for TLR1 (94.4% sensitivity, 95.5% specificity), 0.917 for TLR6 (83.3% sensitivity, 81.8% specificity), and 0.505 for TLR 10. Mean levels of TLR1 and 6 in the persistently infected group (0.118, 0.200) were lower than in the infected group (0.699, 0.249) but higher than in the noninfected group (0.00643, 0.192).

Conclusion: In our pilot study, TLR1 expression in periprosthetic tissues most accurately predicted PJI, with 94.4% sensitivity and 95.5% specificity. This measure of the host response may be particularly helpful in detecting culture-negative infections and avoiding false positives resulting from contamination.

