No current test is sufficiently both specific and sensitive enough to be used as a method for ruling out or confirming periprosthetic joint infection. The authors hypothesized that leukocyte esterase, an enzyme secreted by neutrophils that have been recruited to the site of an infection, could be used in diagnosing periprosthetic joint infection by differentiating between infected and uninfected synovial fluid specimens.

A standard chemical test strip (Chemstrip 7 urine test strip; Roche Diagnostics, Indianapolis, Indiana) was used to determine the presence of leukocyte esterase in the aspirated synovial fluid. The sample was applied to the reagent strip immediately after aspiration, and the test result was read 1 minute later. If a trace reading was indicated after 1 minute, the strip was reread at 2 minutes, and that value was used as the final reading. The colorimetric change was read as negative (white), trace (slightly purple), + (light purple), or ++ (dark purple).

The authors calculated the sensitivity, specificity, and positive and negative predictive values of the leukocyte esterase test in diagnosing periprosthetic joint infection on the basis of 2 scenarios. In the first scenario, a ++ reading was considered a positive result (ie, indicative of the presence of a periprosthetic joint infection), and all other strip readings were considered negative.

In this scenario, the leukocyte esterase test was 80.6% sensitive (95% confidence interval [CI], 61.9%-91.9%) and 100% specific (95% CI, 94.5%-100%), with a positive predictive value of 100% (95% CI, 83.4%-100%) and a negative predictive value of 93.3% (95% CI, 85.4%-97.2%).

In the second scenario, a + or ++ reading was considered a positive result, and trace and negative readings were considered negative for infection. In this scenario, the leukocyte esterase test was 93.5% sensitive (95% CI, 77.2%-98.8%) and 86.7% specific (95% CI, 77.1%-92.9%), with a positive predictive value of 72.5% (95% CI, 55.9%-84.9%) and a negative predictive value of 97.3% (95% CI, 89.7%-99.5%).

Two cohorts of patients participated in the study between May 2007 and April 2010. The intraoperative cohort included 108 knees of patients undergoing revision total knee arthroplasty (TKA). Synovial fluid was aspirated from these patients intraoperatively, and 30 knees were categorized as infected. Twenty-three of these had positive cultures, the most common of which were Staphylococcus species and Streptococcus species.

The second cohort consisted of 20 knees of patients who had previously undergone TKA and were now undergoing a workup for possible periprosthetic knee infection; 5 knees were categorized as infected. As a negative control, the authors analyzed synovial fluid from the knee joint of 8 patients who were preparing to undergo primary TKA.

Both the sensitivity and the specificity of the leukocyte esterase strip test in the diagnosis of periprosthetic joint infection were high. The leukocyte esterase reagent strip provides real-time results, is simple and inexpensive, and has the ability to both rule out and confirm periprosthetic joint infection. These factors will allow surgeons the opportunity to assess patients for the presence of intraoperative infection.
The diagnosis of periprosthetic joint infections remains one of the great clinical challenges in orthopedics. Many algorithms and protocols have been proposed, but a gold standard test remains elusive. In this Level II study from the Rothman Institute at Thomas Jefferson University, the authors tested the hypothesis that the detection of the enzyme leukocyte esterase in synovial joint fluid could predict the presence of a periprosthetic infection. They were able to achieve a high level of sensitivity and specificity, with excellent positive and negative predictive values.

The true value of this article is that it provides clinicians with an inexpensive, simple, and relatively easy point-of-contact test to aid in the diagnosis of a periprosthetic infection. The authors provide a simple algorithm for how this could be incorporated into a clinical practice. Although more work needs to be done to confirm the results and to find solutions to some of the limitations, such as what to do with a bloody tap, I believe that the results are so promising that this should be considered one of the best articles of 2011. One of the hallmarks of a truly outstanding article is that, after reading it, the reader thinks, “Wow, why didn’t I think of that?” I suspect that many people thought the same thing after reading this article.

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