2020 Health Technology Reassessment Report

Methicillin-Resistant Staphylococcus Aureus Genetic Test[Real-Time PCR]

NECA
한국보건의료연구원

Summary

Background of Assessment

The 'Methicillin-Resistant Staphylococcus Aureus(MRSA) genetic test [real-time polymerase chain reaction]' for active surveillance of high-risk patients is a test for active monitoring aimed at preventing MRSA transmission. This test is performed to identify MRSA infection at an early stage using a nasal swab in patients suspected of carrying MRSA.

This test was approved by a new health technology assessment in Korea in 2011 (Ministry of Health and Welfare Notice No. 2011-142, 2011.11.17.), and was announced as a non-benefit service in 2012 (Ministry of Health and Welfare Notice No. 2012-116, September 2012. 14.). Accordingly, through internal monitoring, the National Evidence-based Healthcare Collaborating Agency determined that this test was an agenda that needed review of the evidence for inducing the proper use of health technology and efficient use of health and medical resources, and re-evaluation was carried out The 11th Health Technology Reassessment Committee (2020.11.13.) in 2020 deliberated on the final assessment results of the clinical safety and utility of the technology.

Purpose and Method of Assessment

A systematic literature review was conducted on the medical and scientific evidence for the clinical safety and utility of active surveillance using 'MRSA genetic test [real-time PCR]' in high-risk patients (those who need monitoring for methicillin-resistant Staphylococcus aureus infection or carrier).

The assessment, including the evaluation method, risk of bias evaluation, and final recommendations, was conducted through a subcommittee consisting of a total of 7 members (3 from the Department of Infectious Diseases, 2 from the Department of Laboratory Medicine, 1 from the Department of Critical Care Medicine, and 1 from the Department of Evidence-Based Medicine). The diagnostic accuracy of the MRSA genetic test [real-time PCR] has already been confirmed through the new health technology assessment. In this re-evaluation, the clinical utility of the test was evaluated with emphasis.

Assessment Results

Appropriate use of antibiotics, MRSA infection rate, and medical service use (length of stay, quarantine period, medical expenses) were selected as outcome

indicators to evaluate clinical utility. A total of 1,390 studies were searched through domestic and foreign databases, and a total of 1,082 studies for which duplicates were removed were reviewed. As a result of the literature review, 7 studies were finally selected.

There were three studies reporting the **appropriate use of antibiotics**, and all three studies were retrospective studies without a comparison group on medical outcomes (Giancola et al., 2016; Smith et al., 2017; Dangerfield et al., 2014). Giancola et al. (2016) suggested that when an interventional test was conducted for 200 pneumonia patients admitted to the intensive care unit, it could be prevented with 300 days of the empirical antibiotic treatment period for all patients and 2 days (median) of the treatment period per patient. Smith et al. (2017) found that 77.3% (309/400 patients) of the total number of patients admitted to the intensive care unit who were found to be negative as a result of the intervention test. Among them, it was reported that 54.7% (169/309 patients) had discontinued empirical antibiotic treatment. This suggests that the intervention method can reduce unnecessary antibiotic use at an early stage. Dangerfield et al. (2014) found that among 243 patients with pneumonia treated with empirical antibiotics, the proportion of patients with MRSA positive as a result of an interventional test and true positive as a culture test was 43.6% (17/39). This showed that appropriate antibiotics were used early in 43.6% of cases due to active surveillance through MRSA genetic testing. In addition, the proportion of patients who were negative in the real-time PCR test and confirmed as true negative in the culture test was 99.5% (203/204 patients), which reduces unnecessary antibiotic use due to the real-time PCR method, suggesting that the test was usefully used. As a result of the GRADE evaluation for the three studies, the level of evidence was evaluated as 'Low'.

There were two studies reporting the **MRSA infection rate**, and both studies were historical control studies. (Leung et al., 2013; Stano et al., 2013). Leung et al. (2013) compared a group without active surveillance (control group) and a group with active surveillance using the real-time PCR method (intervention group) on 7,950 MRSA samples detected in ICU patients. Compared with the control group, the average MRSA infection rate Of the ICU in the intervention group decreased by 1.94 cases per 1,000 days of hospitalization (3.67/1,000 patient bed days → 1.73/1,000 patient bed days). Stano et al. (2013) performed active surveillance using the real-time PCR method on 1,008 patients admitted to the intensive care unit. If the real-time PCR test result was true positive, the group with active surveillance measures, such as cohort isolation, and the group without active surveillance measures were compared while maintaining the remaining treatment the same. In the intervention group, the MRSA infection rate decreased from 2.0%

(9/431 patients) to 0.3% (2/577 patients), and the risk of MRSA infection was reduced by 15% (Relative risk: 0.85(95% CI 0.02-0.63; p=0.002)). As a result of the GRADE assessment for the two studies, the level of evidence was evaluated as 'Low'.

Medical use (length of stay, quarantine period, and medical expenses) was reviewed including hospital stay, quarantine period, and medical expenses. There were three studies reporting medical use (Smith et al., 2017; Wassenberg, et al., 2012; Wassenberg et al., 2010). In a study by Smith et al. (2017), patients who were able to stop (de-escalation) antibiotic treatment early among those who were confirmed as negative as a result of real-time PCR were 54.7% (169/309 patients). Accordingly, it was suggested that $21,031 of medical expenses related to antibiotics (vancomycin) could be saved for all patients and that medical expenses of $108 per patient could be saved. In the study by Wassenberg et al. (2012), a prospective cohort study, active surveillance was conducted on 163 patients admitted to the intensive care unit, using the real-time PCR device 'BD GeneOhm' for 89 patients and using the real-time PCR device 'GeneXpert' for 74 patients. When the culture test and the intervention test were compared, the quarantine period for all patients decreased a total of 368 days (44.3%) from 831 days to 463 days. The quarantine period due to MRSA infection was reduced from 96.0 hours to 27.6 hours in the ‘BD GeneOhm’ device and 21.4 hours in the ‘GeneXpert’ device. Also, it was suggested that the medical cost savings due to the reduction of the quarantine period were €136.04 per day for the 'BD GeneOhm' device and €121.76 for the 'GeneXpert' device. In the prospective cohort study by Wassenberg et al.(2010), active surveillance was conducted for 1,764 high-risk hospitalized patients, using the real-time PCR device 'BD GeneOhm' for 853 patients and using the real-time PCR device 'GeneXpert' for 911 patients. When the culture test and the intervention test were compared, the quarantine period for all patients decreased a total of 3,670 days (60.0%) from 6,112 days to 2,442 days. The quarantine period was reduced from 76.2 hours to 19.7 hours on the 'BD GeneOhm' device and 16.1 hours on the 'GeneXpert' device. In addition, the medical costs saved due to the reduction of the quarantine period were suggested €95.77 per day for the 'BD GeneOhm' device and €25.43 for the 'GeneXpert' device. As a result of the GRADE assessment for the three studies, the level of evidence was evaluated as 'Low'.

Conclusion

The subcommittee made the following recommendations based on the current evaluation results.

The clinical utility of the MRSA genetic test [real-time PCR] used for active

surveillance in high-risk patients (those who need monitoring for MRSA infection or carriers) was evaluated based on a total of 7 studies. Regarding the use of appropriate antibiotics, which is a critical outcome indicator, although the level of evidence is ‘Low’ grade, active surveillance using interventional tests was judged to be able to guide the use of appropriate antibiotics, such as reducing unnecessary use of antibiotics, by screening for infections or carriers more quickly than conventional tests. Also, it was judged to be clinically useful as it has the effect of reducing medical costs due to reduction of MRSA infection rate, use of antibiotics, and reduction of the quarantine period.

Accordingly, the Health Technology Reassessment Committee deliberated as follows based on the subcommittee review results for the MRSA genetic test [real-time PCR] used for active surveillance in high-risk patients (those who need surveillance for MRSA infection or carriers). (2020.11.13.). Real-time polymerase chain reaction was judged to have clinical utility when it is performed for active surveillance purposes in high-risk patients (those who need surveillance for MRSA infection or carriers) because it has a short test time and the effect of reducing medical costs by decreasing the MRSA infection rate, using appropriate antibiotics, reducing the quarantine period.

The Health Technology Reassessment Committee deliberated active surveillance using 'MRSA genetic test [real-time PCR]' as 'recommended' (recommendation grade Ia) for high-risk patients (those who need monitoring for MRSA infection or carrier).