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Research Article

Diagnostic Performance of the BioFire® Joint Infection Panel in Native Septic Arthritis and Periprosthetic Joint Infection: A Retrospective Diagnostic Accuracy Study

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ABSTRACT

Objective: Rapid identification of causative microorganisms is essential in suspected native septic arthritis and periprosthetic joint infection. This study evaluated the diagnostic performance of the BioFire® Joint Infection Panel and assessed its agreement with conventional culture and systemic inflammatory biomarkers.

Methods: Hospital records from January 2025 to April 2026 were retrospectively reviewed. Of 115 screened patients with suspected joint infection, nine were excluded because BioFire® testing had not been performed and only culture results were available. The final analysis included 106 synovial fluid samples. All samples were tested using conventional culture and the BioFire® Joint Infection Panel during the same clinical episode. Demographic data, infection category, localization, C-reactive protein, erythrocyte sedimentation rate, procalcitonin, and white blood cell count were recorded. Agreement was assessed using Cohen's kappa, discordance using the McNemar test, and diagnostic performance using culture as the reference method.

Results: Sixty-five samples (61.3%) were classified as suspected native septic arthritis and 41 (38.7%) as periprosthetic joint infection. BioFire® was positive in 22 samples (20.8%) and culture was positive in 32 (30.2%). Overall agreement was 86.8%, with substantial agreement according to Cohen's kappa (0.656). Discordance was significant, predominantly due to culture-positive/BioFire®-negative samples (P = 0.013). BioFire® showed 62.5% sensitivity [95% confidence interval (CI): 43.7-78.9), 97.3% specificity (95% CI: 90.6-99.7), 90.9% positive predictive value, 85.7% negative predictive value, and 86.8% accuracy. C-reactive protein, procalcitonin, and white blood cell counts were significantly higher in patients with suspected native septic arthritis.

Conclusion: The BioFire® Joint Infection Panel provides rapid and highly specific microbiological support in suspected joint infection. However, its moderate sensitivity and inability to detect off-panel organisms indicate that it should complement rather than replace conventional culture.

Keywords: Septic arthritis, periprosthetic joint infection, polymerase chain reaction, microbiological techniques, synovial fluid

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INTRODUCTION

Septic arthritis and periprosthetic joint infection (PJI) are serious orthopedic infections that may lead to irreversible joint damage, systemic sepsis, repeated surgery, increased morbidity, and mortality when diagnosis and treatment are delayed.[1,2] Rapid and accurate pathogen identification is therefore central to targeted antimicrobial therapy, surgical planning, and risk stratification.[3] Conventional microbiological culture of synovial fluid and tissue specimens remains the cornerstone of microbiological diagnosis, but pathogen recovery is time-dependent and may be affected by sample volume, bacterial burden, previous antibiotic exposure, biofilm formation, and the presence of slow-growing or low-virulence microorganisms.[4-7]

These limitations are particularly relevant in PJI, where biofilm-associated pathogens may be difficult to recover by standard culture methods, and in native septic arthritis, where empirical antibiotic treatment before aspiration may reduce culture positivity. As a result, molecular diagnostic approaches, including syndromic multiplex polymerase chain reaction (PCR) panels, have attracted increasing interest because they can provide standardized pathogen detection in a substantially shorter time frame.[8]

The BioFire® FilmArray® Joint Infection Panel (bioMérieux, Marcy-l'Étoile, France) is a closed, automated, multiplex molecular diagnostic system developed for the analysis of synovial fluid. The panel can detect, directly from synovial fluid, a predefined set of bacterial and fungal targets and selected antimicrobial resistance genes in approximately one hour.[9,10] Recent studies have suggested that the panel may improve early microbiological documentation, contribute to the management of culture-negative cases, and support timely antimicrobial stewardship.[11-16]

Nevertheless, the clinical usefulness of the panel depends on the target spectrum, organism burden, the biology of biofilm-related disease, and the presence of off-panel microorganisms. Moreover, the relationship between molecular positivity and systemic inflammatory response may differ between suspected native septic arthritis and PJI. This study aimed to evaluate the diagnostic performance of the BioFire® Joint Infection Panel, its agreement with conventional culture, and its association with systemic inflammatory biomarkers in patients evaluated for suspected native or prosthetic joint infection.

MAIN POINTS

- The BioFire® Joint Infection Panel showed high specificity and positive predictive value in suspected joint infection.
- Moderate sensitivity and discordance between culture-positive and BioFire-negative results indicate that negative BioFire results cannot exclude infection.
- The panel may provide rapid microbiological guidance when urgent organism-directed treatment decisions are required.
- Suspected native septic arthritis showed a stronger systemic inflammatory response than in periprosthetic joint infection.
- BioFire testing should be interpreted as an adjunct to, rather than a replacement for, conventional culture.

MATERIALS AND METHODS

Study Design and Population

This retrospective diagnostic accuracy study included synovial fluid samples obtained from patients evaluated in our clinic for suspected joint infection. The study was prepared in accordance with the standards for reporting of diagnostic accuracy (STARD) principles for diagnostic accuracy research and the Declaration of Helsinki. Ethics committee approval was obtained from the Erzincan University Faculty of Medicine Ethics Committee (approval no: 2025-18/03, date: 16.10.2025).

In this retrospective study, hospital records from January 2025 to April 2026 were reviewed, and 115 patients with suspected joint infection were initially screened. The cohort comprised patients who presented to the emergency department or the orthopedic outpatient clinic with suspected septic arthritis, and patients with prosthetic joints who developed acute clinical findings suggestive of infection, such as periarticular effusion, increased local temperature, and pain. PJI was classified according to institutional diagnostic practice based on clinical findings, serum inflammatory markers, synovial fluid analysis, microbiological results, and intraoperative findings when available. Nine patients were excluded because BioFire® Joint Infection Panel testing had not been performed, and only conventional culture results were available for these patients. Accordingly, the final analysis included 106 synovial fluid samples, each assessed concurrently by conventional culture and the BioFire® Joint Infection Panel during the same clinical episode. Samples with invalid or non-evaluable molecular results were excluded. Clinical and demographic variables, including age, sex, prosthesis status, infection category, and anatomical localization, were extracted from the hospital information management system. After clinical evaluation, cases were categorized as suspected native septic arthritis or suspected PJI. The unit of analysis was the synovial fluid sample. The patient selection process and final study cohort are summarized in the STARD flow diagram (Figure 1).

Laboratory Parameters

C-reactive protein (CRP, mg/L), erythrocyte sedimentation rate (ESR, mm/h), procalcitonin (PCT, ng/mL), and white blood cell count (WBC, 10^3/μL) were recorded from venous blood samples collected on the day of joint aspiration. Biochemical and hematological analyses were performed in the central laboratory of our hospital according to standardized procedures. The exact timing of biomarker sampling relative to antibiotic administration was not consistently available in the retrospective records; therefore, biomarker values were defined as those obtained on the day of aspiration.

Conventional Microbiology

Synovial fluid samples were aspirated under sterile conditions and immediately transferred to the microbiology laboratory. For conventional microbiological assessment, samples were

inoculated onto blood agar, MacConkey agar, and chocolate agar plates and also introduced into aerobic and anaerobic blood culture bottles for enrichment, according to the laboratory protocol. In suspected native joint infection, culture plates were incubated for 5-7 days; in suspected PJI, incubation was extended to 14 days to improve detection of low-virulence or biofilm-forming organisms, including Cutibacterium acnes. Colony identification and antimicrobial susceptibility testing were performed using the laboratory's routine matrix-assisted laser desorption/ionization time-of-flight mass spectrometry and automated systems.

BioFire Joint Infection Panel

In parallel with culture, approximately 0.2 mL of synovial fluid was analyzed using the BioFire Joint Infection Panel. In accordance with the manufacturer's instructions, the sample was mixed with the designated hydration solution, loaded into the cartridge, and placed in the BioFire FilmArray system. The closed cartridge performs cell lysis, nucleic acid extraction, reverse transcription (when required), multiplex PCR amplification, and fluorescent probe-based detection. Results were reported by the software as Detected, Not Detected, or Invalid. The target spectrum of the panel is summarized in Table 1.

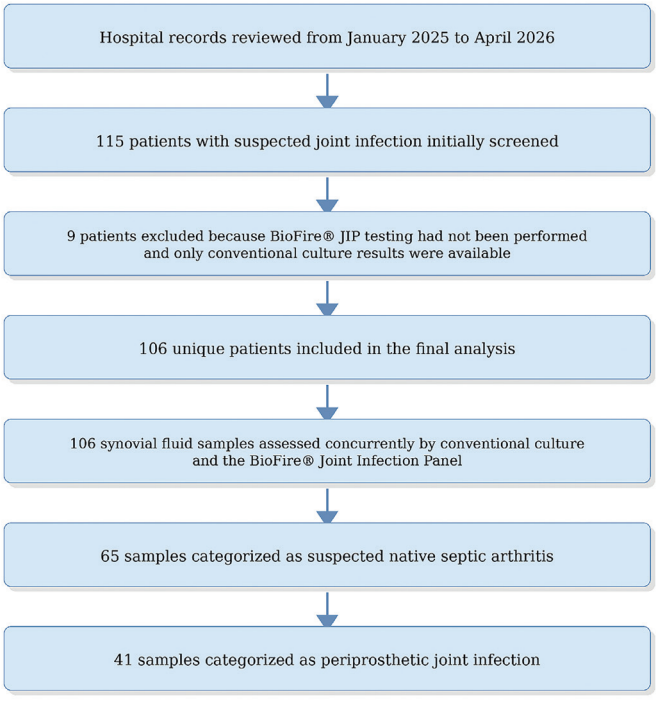


Figure 1. STARD flow diagram of patient selection and inclusion process. Hospital records from January 2025 to April 2026 were retrospectively reviewed. Among 115 initially screened patients with suspected joint infection, nine were excluded because BioFire® Joint Infection Panel testing had not been performed and only conventional culture results were available. The final analysis included 106 synovial fluid samples obtained from 106 unique patients, including 65 samples categorized as suspected native septic arthritis and 41 samples categorized as periprosthetic joint infection.

Statistical Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences, version 26.0 (IBM Corp., Armonk, NY, USA). The distribution of continuous variables was evaluated using the Shapiro-Wilk test and visual methods. Non-normally distributed continuous variables were reported as median [interquartile range (IQR)]; categorical variables were reported as frequencies and percentages. Either the chi-square test or Fisher's exact test was used for categorical variables, and the Mann-Whitney U test was used for continuous variables. Agreement between BioFire and culture was evaluated using Cohen's kappa coefficient, and directional discordance was assessed using the McNemar test. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy were calculated using conventional culture as the reference method. A P value of < 0.05 was considered statistically significant. Exact 95% confidence intervals were calculated for sensitivity, specificity, PPV, negative predictive value, and overall diagnostic accuracy using the binomial method.

RESULTS

The study included 106 synovial fluid samples. Female and male patients were equally represented, with 53 patients (50.0%) from each sex. The overall mean age was 65.6 ± 15.5 years, and the median age was 66.5 years (IQR: 59.5-77.0). According to clinical categorization, 65 samples (61.3%) were classified as suspected native septic arthritis and 41 (38.7%) as PJI. The most common anatomical site was the knee (n=73, 68.9%), followed by the hip (n=21, 19.8%), the ankle (n=5, 4.7%), the elbow (n=5, 4.7%), and the shoulder (n=2, 1.9%) (Table 2).

Sex distribution did not differ significantly between the suspected native septic arthritis and PJI groups (P = 0.231). Age distributions were also similar between the groups, with median ages of 67 years in the suspected native septic arthritis group and 66 years in the PJI group (P = 0.763). In contrast, localization differed significantly between groups ($P < 0.001$). The knee was the predominant site in suspected native septic arthritis, whereas involvement of the knee and hip was equally represented in PJI (Table 2).

The BioFire panel was negative in 84 samples (79.2%) and positive in 22 samples (20.8%). Conventional culture was negative in 74 samples (69.8%) and positive in 32 samples (30.2%). When both methods were evaluated together, 20 samples were positive by both methods, and 72 were negative by both. Overall observed agreement was 86.8%, and Cohen's kappa was 0.656, indicating substantial agreement. Discordance was asymmetric, with significantly more culture-positive/BioFire-negative samples than BioFire-positive/culture-negative samples (McNemar P = 0.013) (Table 3).

Using conventional culture as the reference method, the BioFire® Joint Infection Panel demonstrated a sensitivity of 62.5% (95% CI: 43.7-78.9), specificity of 97.3% (95% CI: 90.6-99.7), PPV of 90.9% (95% CI: 70.8-98.9), negative predictive value of 85.7% (95% CI: 76.4-92.4), and overall diagnostic accuracy of 86.8% (95% CI: 78.8-92.6) (Table 4). BioFire positivity was observed

Table 1. Targets Detected by the BioFire® Joint Infection Panel

Category	Microorganisms/Resistance Genes
Gram-positive bacteria	*Enterococcus faecalis*; *Enterococcus faecium*; *Listeria monocytogenes*; *Staphylococcus aureus*; *Staphylococcus lugdunensis*; *Streptococcus agalactiae* (Group B); *Streptococcus pneumoniae*; *Streptococcus pyogenes* (Group A); *Streptococcus anginosus* group (S. *anginosus*, S. *intermedius*, S. *constellatus*); *Streptococcus dysgalactiae*
Gram-negative bacteria	*Bacteroides fragilis*; *Citrobacter* spp. (*C. freundii, C. koseri, C. amalonaticus*); *Enterobacter* cloacae complex; *Escherichia coli*; *Haemophilus* influenzae; *Kingella kingae*; *Klebsiella aerogenes*; *Klebsiella pneumoniae* group; *Klebsiella oxytoca*; *Morganella morganii*; *Neisseria gonorrhoeae*; *Proteus* spp.; *Pseudomonas aeruginosa*; *Salmonella* spp.; *Serratia marcescens*
Yeast	*Candida albicans*; *Candida glabrata*
Antimicrobial resistance genes	Carbapenemases: blaIMP, blaKPC, blaNDM, blaOXA-48-like, blaVIM; extended-spectrum beta-lactamase: blaCTX-M; methicillin resistance: mecA/C and mecA/C with MREJ; vancomycin resistance: vanA/B

Target list is presented for interpretation of potential on-panel and off-panel discordance. BioFire JIP: BioFire® Joint Infection Panel; MREJ: *Staphylococcal* cassette chromosome mec right-extremity junction.

Table 2. Demographic and Clinical Characteristics of the Study Population

Parameters	Total (n=106)	Suspected Native Septic Arthritis (n=65)	PJI (n=41)	P value
Gender, n (%)				0.231
Female	53 (50.0)	30 (46.2)	23 (56.1)	
Male	53 (50.0)	35 (53.8)	18 (43.9)	
Age (years)				0.763
Median (IQR)	66.5 (59.5-77.0)	67 (58.0-78.0)	66 (60.0-76.5)	
Localization, n (%)				**<0.001**
Knee	73 (68.9)	55 (84.6)	18 (43.9)	
Hip	21 (19.8)	3 (4.6)	18 (43.9)	
Ankle	5 (4.7)	4 (6.2)	1 (2.4)	
Elbow	5 (4.7)	2 (3.1)	3 (7.3)	
Shoulder	2 (1.9)	1 (1.5)	1 (2.4)	

IQR: interquartile range; PJI: periprosthetic joint infection.

Table 3. Comparison of BioFire Joint Infection Panel and Conventional Culture Results

	Culture (+)	Culture (-)	Total
BioFire JIP (+)	20	2	22
BioFire JIP (-)	12	72	84
Total	32	74	106

BioFire JIP: BioFire® Joint Infection Panel. Overall agreement: 86.8%; Cohen's kappa: 0.656; McNemar P = 0.013.

Table 4. Diagnostic Performance of the BioFire® Joint Infection Panel Using Conventional Culture as the Reference Method

Parameter	Value	95% CI
Sensitivity	62.5%	43.7-78.9
Specificity	97.3%	90.6-99.7
Positive predictive value	90.9%	70.8-98.9
Negative predictive value	85.7%	76.4-92.4
Accuracy	86.8%	78.8-92.6

CI: confidence interval.

in 13 of 65 samples (20.0%) in the suspected native septic arthritis group and in 9 of 41 samples (22.0%) in the PJI group, with no statistically significant difference between groups (P = 0.811). Culture positivity was observed in 16 of 65 samples (24.6%) from the suspected native septic arthritis group and in 16 of 41 samples (39.0%) from the PJI group; however, this difference did not reach statistical significance (P = 0.132).

Discordant results were observed in 14 samples. Two samples were BioFire-positive/culture-negative, whereas 12 samples were culture-positive/BioFire-negative. Because conventional culture is an imperfect reference standard in joint infection, particularly in patients with prior antibiotic exposure or biofilm-associated infection, BioFire-positive/culture-negative results were interpreted as discordant findings rather than definitive false-positive results. Conversely, culture-positive/BioFire-negative discordance may have been related to off-panel microorganisms, a low organism burden below the analytical detection threshold of the molecular panel, or low-inoculum organisms commonly encountered in indolent or biofilm-associated infections. Table 5 summarizes the microorganisms or molecular targets identified in the 14 discordant samples. The two BioFire-positive/culture-negative samples were *Streptococcus* spp. (from a PJI knee sample) and Klebsiella aerogenes (from a suspected native septic arthritis knee sample). The 12 culture-positive/BioFire-negative samples

Table 5. Microorganisms or Molecular Targets Identified in Discordant Cases

Case	Study sample no.	Infection category	Location	Discordance pattern	BioFire® JIP result	Culture result	Interpretation
1	15	Periprosthetic joint infection	Knee	BioFire® positive / culture negative	*Streptococcus* spp., no resistance marker	Negative	BioFire® target detected despite negative culture; possible culture limitation, prior antibiotics, low viable burden, or nonviable DNA.
2	16	Suspected native septic arthritis	Knee	BioFire® positive / culture negative	*Klebsiella aerogenes;* no resistance marker	Negative	BioFire® target detected despite negative culture; possible culture limitation, prior antibiotics, low viable burden, or nonviable DNA.
3	2	Suspected native septic arthritis	Hip	Culture positive / BioFire® negative	Not detected	*Staphylococcus aureus*	On-panel organism; possible low organism burden, sampling variation, or inhibition.
4	5	Suspected native septic arthritis	Knee	Culture positive / BioFire® negative	Not detected	*Achromobacter denitrificans*	Off-panel organism.
5	29	Suspected native septic arthritis	Knee	Culture positive / BioFire® negative	Not detected	*Brucella spp.*	Off-panel organism.
6	45	Periprosthetic joint infection	Knee	Culture positive / BioFire® negative	Not detected	*Staphylococcus epidermidis*	Off-panel low-virulence skin flora organism.
7	48	Periprosthetic joint infection	Knee	Culture positive / BioFire® negative	Not detected	*Staphylococcus lugdunensis*	On-panel organism; possible low organism burden, sampling variation, or inhibition.
8	55	Periprosthetic joint infection	Knee	Culture positive / BioFire® negative	Not detected	*Staphylococcus hominis and Staphylococcus epidermidis*	Off-panel low-virulence skin flora organisms.
9	68	Periprosthetic joint infection	Hip	Culture positive / BioFire® negative	Not detected	*Staphylococcus hominis*	Off-panel low-virulence skin flora organism.
10	69	Periprosthetic joint infection	Hip	Culture positive / BioFire® negative	Not detected	*Corynebacterium simulans*	Off-panel low-virulence skin flora organism.
11	72	Periprosthetic joint infection	Hip	Culture positive / BioFire® negative	Not detected	*Staphylococcus epidermidis*	Off-panel low-virulence skin flora organism.
12	82	Suspected native septic arthritis	Knee	Culture positive / BioFire® negative	Not detected	*Brucella* spp.	Off-panel organism.
13	86	Periprosthetic joint infection	Knee	Culture positive / BioFire® negative	Not detected	*Staphylococcus haemolyticus*	Off-panel low-virulence skin flora organism.
14	88	Periprosthetic joint infection	Knee	Culture positive / BioFire® negative	Not detected	*Staphylococcus epidermidis*	Off-panel low-virulence skin flora organism.

BioFire® JIP, BioFire® Joint Infection Panel; PJI, periprosthetic joint infection. Independent molecular confirmation, such as broad-range 16S rRNA sequencing, was not performed.

included *Staphylococcus* aureus (n=1), *Achromobacter* denitrificans (n=1), *Brucella* spp. (n=2), *Staphylococcus epidermidis* (n=3), *Staphylococcus lugdunensis* (n=1), mixed *Staphylococcus hominis* and *Staphylococcus epidermidis* (n=1), *Staphylococcus hominis* (n=1), *Corynebacterium simulans* (n=1), and *Staphylococcus haemolyticus* (n=1). Most culture-positive/BioFire-negative discordant samples involved organisms outside the panel's target spectrum or low-virulence skin flora, whereas Staphylococcus aureus and Staphylococcus lugdunensis were on-panel organisms.

Among positive samples, *Staphylococcus aureus* was the most frequently identified organism by both BioFire and culture. The BioFire panel also detected Candida albicans and Streptococcus species. Conventional culture also identified *Streptococcus agalactiae*, *Staphylococcus epidermidis*, and other organisms. BioFire detected the mecA/C and MREJ resistance markers compatible with methicillin-resistant *Staphylococcus aureus* in three samples, and CTX-M in one sample.

In the overall cohort, the median CRP, ESR, PCT, and WBC were 66.2 mg/L, 31 mm/h, 0.075 ng/mL, and 9.61 × 10^3/μL, respectively. The systemic inflammatory response was more prominent in suspected native septic arthritis. Median CRP was 80.4 mg/L in suspected native septic arthritis and 18.9 mg/L in PJI (P = 0.004). Median PCT (P = 0.005) and WBC (P = 0.009)

values were also significantly higher in patients with suspected native septic arthritis. ESR did not differ significantly between groups (P = 0.842). When biomarkers were compared by BioFire positivity, CRP, ESR, PCT, and WBC values were numerically higher in BioFire-positive samples, but most differences were not statistically significant.

DISCUSSION

This study demonstrated that the BioFire Joint Infection Panel had high specificity, high PPV, and substantial agreement with conventional culture in patients evaluated for suspected native septic arthritis or PJI. The overall agreement rate of 86.8% and a kappa value of 0.656 indicate that the panel can provide clinically useful microbiological information. However, the moderate sensitivity and the predominance of culture-positive/BioFire-negative discordance support its use as a rapid adjunct to culture.

The high specificity of 97.3% and the PPV of 90.9% are clinically important. In practice, a positive molecular result can rapidly support organism-directed antimicrobial treatment, particularly when urgent therapeutic decisions are required in acute septic arthritis. The approximately one-hour turnaround time of the panel may also facilitate early antimicrobial stewardship by allowing earlier narrowing or escalation of empirical regimens when a target organism or resistance marker is detected.[9-16]

The sensitivity of 62.5% observed in our cohort requires careful interpretation. Culture-positive/BioFire-negative samples may reflect a low bacterial burden below the analytical detection threshold, organisms not included in the panel, or pathogens associated with indolent biofilm-related infection. Conventional culture was used as the reference method, but it may also be affected by prior antibiotic exposure, sample volume, transport conditions, organism burden, incubation requirements, and slow-growing or biofilm-forming microorganisms. Accordingly, discordant results should be interpreted together with clinical, laboratory, and intraoperative findings rather than in isolation.

The distribution of organisms in our study was consistent with the established microbiology of joint infections, with Staphylococcus aureus being the most frequently detected pathogen. The ability of the panel to detect mecA/C and MREJ directly from synovial fluid may be valuable in cases of suspected methicillin-resistant Staphylococcus aureus infection, because early recognition of resistance can influence empirical treatment. Nevertheless, the panel does not include all potentially relevant bacteria, fungi, or resistance mechanisms; this restricted target range explains the need for culture, prolonged incubation when indicated, and clinical correlation

A notable finding was that suspected native septic arthritis and PJI exhibited different inflammatory biomarker profiles. CRP, PCT, and WBC were significantly higher in patients with suspected native septic arthritis, whereas ESR did not differ significantly. This pattern suggests that suspected native septic arthritis is more often associated with an acute systemic inflammatory response, whereas PJI may present with a more indolent biomarker profile because of biofilm formation and lower-virulence pathogens. Consequently, reliance on systemic biomarkers alone may be insufficient in suspected PJI, and microbiological tests should be interpreted within the broader clinical context.

The relationship between BioFire positivity and systemic inflammatory biomarkers was limited. Although median biomarker values were numerically higher in BioFire-positive samples, most differences were not statistically significant. Molecular positivity reflects the presence of a target nucleic acid, whereas systemic biomarker concentrations are influenced by infection duration, organism virulence, host immune response, comorbidities, and previous treatment. These findings suggest that molecular testing and systemic inflammatory markers provide different diagnostic information.

Study Limitations

This study has several limitations. First, its retrospective design may have introduced selection bias and limited the availability of some clinically relevant variables. Second, conventional culture was used as the reference method, although it is not a perfect gold standard for diagnosing joint infection, particularly in patients who received antibiotics before aspiration or in infections involving low-virulence or biofilm-forming organisms. Third, prior antibiotic exposure the exact timing of biomarker sampling relative to antibiotic administration, synovial fluid leukocyte count, polymorphonuclear cell percentage, intraoperative findings, histopathological data, and treatment modifications based on BioFire® results were not uniformly available. Fourth, because the analysis was conducted at the synovial-fluid sample level, potential within-patient correlation could not be fully addressed. Fifth, the sample size limited the ability to perform detailed subgroup analyses, particularly within the PJI group and for individual pathogens. Sixth, this was a single-center study reflecting local patient selection and microbiological epidemiology; therefore, the generalizability of the findings to other institutions may be limited. Finally, off-panel organisms and discordant results were not further evaluated using an independent molecular reference method, such as broad-range 16S rRNA sequencing. Prospective multicenter studies using composite diagnostic standards are needed to better define the diagnostic and clinical impact of BioFire® testing in native and prosthetic joint infections.

CONCLUSION

The BioFire® Joint Infection Panel is a rapid, highly specific microbiological diagnostic tool for cases of suspected joint infection. A positive result may guide early organism-directed management; however, moderate sensitivity and off-panel limitations mean a negative result does not exclude infection. The panel should therefore be interpreted in conjunction with conventional culture and clinical findings. Prospective studies using composite diagnostic standards are needed to define its clinical and economic impact on native septic arthritis and PJI.

Ethics

Ethics Committee Approval: The ethics committee approval and permission for the study were obtained from the Erzincan Binali Yıldırım University Clinical Research Ethics Committee with the decision number 2025-18/03, date 16.10.2025.

Informed Consent: The requirement for informed consent was waived because the study used a retrospective design with anonymized patient data.

Footnotes

Author Contributions

Concept Design – M.B.G., V.G., A.Ö., F.Y.; Data Collection or Processing – M.B.G., N.B.T., H.D., B.G., S.A.; Analysis or Interpretation – M.B.G., F.Y.; Literature Review – M.B.G., V.G., A.Ö., İ.D., N.B.T., H.D., S.A.; Writing, Reviewing and Editing – M.B.G., F.Y.

Declaration of Interest: The authors declared no conflicts of interest.

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REFERENCES

1. Weston VC, Jones AC, Bradbury N, Fawthrop F, Doherty M. Clinical features and outcome of septic arthritis in a single UK Health District 1982-1991. *Ann Rheum Dis*. 1999;58(4):214-219. [CrossRef]
2. Mathews CJ, Weston VC, Jones A, Field M, Coakley G. Bacterial septic arthritis in adults. *Lancet*. 2010;375(9717):846-855. [CrossRef]
3. Ravn C, Neyt J, Benito N, et al. Guideline for management of septic arthritis in native joints (SANJO). *J Bone Jt Infect*. 2023;8(1):29-37. [CrossRef]
4. Kalbian I, Park JW, Goswami K, Lee YK, Parvizi J, Koo KH. Culture-negative periprosthetic joint infection: prevalence, aetiology, evaluation, recommendations, and treatment. *Int Orthop*. 2020;44(7):1255-1261. [CrossRef]
5. Lenguerrand E, Whitehouse MR, Beswick AD, Kunutsor SK, Burston B, Porter M, Blom AW.Risk factors associated with revision for prosthetic joint infection after hip replacement: a prospective observational cohort study. *Lancet Infect Dis*. 2018;18(9):1004-1014. [CrossRef]
6. Tande AJ, Patel R. Prosthetic joint infection. *Clin Microbiol Rev*. 2014;27(2):302-345. [CrossRef]
7. Tkadlec J, Peckova M, Sramkova L, et al. The use of broad-range bacterial PCR in the diagnosis of infectious diseases: a prospective cohort study. *Clin Microbiol Infect*. 2019;25(6):747-752. [CrossRef]
8. Berneking L, Haas M, Frielinghaus L, et al. Evaluation of a syndromic panel polymerase chain reaction assay for the diagnosis of device-associated bone and joint infections. *Int J Infect Dis*. 2022;116:283-288. [CrossRef]
9. Berinson B, Spenke L, Krivec L, et al. Performance and hypothetical impact on joint infection management of the BioFire Joint Infection Panel: a retrospective analysis. *J Clin Microbiol*. 2023;61(8):e0059223. [CrossRef]
10. Gaillard T, Dupieux-Chabert C, Roux AL, et al. A prospective multicentre evaluation of BioFire Joint Infection Panel for the rapid microbiological documentation of acute arthritis. *Clin Microbiol Infect*. 2024;30(7):905-910. [CrossRef]
11. Pascual S, Noble B, Ahmad-Saeed N, et al. Potential value of a rapid syndromic multiplex PCR for the diagnosis of native and prosthetic joint infections: a real-world evidence study. *J Bone Jt Infect*. 2024;9(1):87-97. [CrossRef]
12. Lund-Andersen J, Petersen MLH, Kostadinov K, Friis-Hansen L, Calum H, Overgaard S. Clinical evaluation of a multiplex PCR-based test for joint infection: a prospective diagnostic accuracy study of forty-nine patients. *Eur J Orthop Surg Traumatol*. 2024;34(8):4105-4111. [CrossRef]
13. Hoffman T, Kriger O, Cohen S, Gefen-Halevi S, Yahav D, Amit S. Real-life experience and diagnostic utility of the BioFire Joint Infection PCR Panel in bone and joint infections: analysis of a prospective validation study. *Infect Dis Ther*. 2023;12(5):1437-1443. [CrossRef]
14. Berinson B, Tanida K, Spenke L, et al. Prospective evaluation of real-world performance and clinical impact of the BioFire FilmArray Joint Infection Panel. *Microbiol Spectr*. 2025;13(4):e0223924. [CrossRef]
15. Balada-Llasat JM, Stamas N, Vincent T, et al. Epidemiology and economic outcomes associated with timely versus delayed receipt of appropriate antibiotic therapy among US patients hospitalized for native septic arthritis: a retrospective cohort study. *Antibiotics* (Basel). 2022;11(12):1732. [CrossRef]
16. Gardete-Hartmann S, Mitterer JA, Sebastian S, et al. The role of BioFire Joint Infection Panel in diagnosing periprosthetic hip and knee joint infections in patients with unclear conventional microbiological results. *Bone Joint Res*. 2024;13(7):353-361. [CrossRef]