

A RETROSPECTIVE STUDY ON DIAGNOSTIC CONCORDANCE BETWEEN TISSUE CULTURE, AND HISTOPATHOLOGY TESTING FOR SKIN AND SOFT TISSUE INFECTIONS

Dr. Reddy Kavitha¹, Dr. Shilpa HS²

¹ Assistant Professor, Department of Pathology, Prathima Institute of Medical Sciences, Karimnagar

² Assistant Professor, Department of Microbiology, Prathima Institute of Medical Sciences, Karimnagar

Corresponding Author

Dr. Shilpa HS

Assistant Professor, Department
of Microbiology, Prathima
Institute of Medical Sciences,
Karimnagar

Article Received: 14-11-2022

Article Accepted: 09-12-2022

©2022 Biomedical and
Biopharmaceutical Research. This is
an open access article under the
terms of the Creative Commons
Attribution 4.0 International License.

ABSTRACT

Background: Skin and soft tissue infections (SSTIs) include a wide range of diseases, account for a major proportion of infections that need hospitalization, and are linked with significant morbidity. Tissue culture and histopathology are the standard diagnostic modalities for skin and soft tissue infections (SSTIs). The current study was conducted to examine the relationship between histopathology tests and tissue culture results for suspected SSTIs.

Materials And Methods: This retrospective study was done on 60 cases of suspected SSTI obtained from inpatient consultation records. The rate of concordance between tissue culture results and histopathology testing was determined.

Results: Overall concordance between histopathology testing and tissue culture results was high (77.5%). For patients classified by histology and tissue culture as having no signs of infection, fungal infection, or mycobacterial infection, concordance was high. Concordance was lower for suspected SSTIs with bacterial infection by histopathology and tissue culture. Age, sex, usage of antibiotics, immunologic state, and biopsy size did not significantly impact concordance rates.

Conclusion: This study found high concordance between histopathology and tissue culture for suspected SSTIs with no clinical indication of infection, including fungal and mycobacterial SSTIs.

KEYWORDS: Concordance, histopathology, tissue culture, skin and soft tissue infection.

INTRODUCTION

Skin and soft tissue infections (SSTIs) include a wide range of diseases, account for a major proportion of infections that need hospitalization, and are linked with significant morbidity (1-3). SSTIs are clinical entities with varying appearance, origin, and severity caused by microbial invasion of the skin's layers and underlying soft tissues. They range from benign infections like impetigo or ecthyma to catastrophic, life-threatening infections like necrotizing fasciitis (2-5). Although superficial SSTIs are usually moderate, they may advance to systemic and even deadly infections in a matter of days, especially in immunocompromised individuals [6]. As a result, prompt diagnosis and pathogen categorization are critical for early and effective therapy [7].

SSTIs' diverse clinical presentations make clinical diagnosis difficult, often necessitating the use of microbiological tests. SSTIs are typically diagnosed using histopathology and tissue culture [8]. Histopathology testing may quickly identify the pathogen but needs expert staff. Tissue culture allows for more exact identification of the pathogen and its sensitivity to treatments, but its application is restricted due to the slow turnaround time and the difficulty to grow particular infections [9]. Tissue culture testing is

regarded as the gold standard for SSTIs [10]. As a consequence, tissue cultures are often performed simultaneously with histological studies in clinical settings [11].

The present study was done to determine the correlation of histopathology tests and tissue culture findings for suspected SSTIs.

MATERIALS AND METHODS

This retrospective study was conducted in the department of pathology & microbiology at Prathima Institute of Medical Sciences, Karimnagar for the period of 1 year between January 2021 and December 2021 after taking the approval from the Institutional ethics committee. Suspected SSTI cases were collected from the dermatological department's inpatient consultation records. Cases involving tissue culture and concomitant histological examination were considered. Viral infections and those with insufficient documentation were excluded.

Clinical data were analyzed retrospectively for demographic, microbiological, and clinical parameters. The biopsy tissue was divided into two sizes: less than or equal to 4 mm and less than or equal to 5 mm. The usage of antimicrobials during biopsy testing was documented. Patients were considered immunosuppressed if they had a history of solid or bone marrow transplants, lymphoma, leukemia, primary malignancies, systemic lupus erythematosus, human immunodeficiency virus/acquired immunodeficiency syndrome, lymphoproliferative disorders (such as myelodysplastic syndrome), leukopenia, neutropenia, or pancytopenia.

The key outcome measure for SSTI diagnosis was the rate of concordance between tissue culture results and histopathology testing. The rate of agreement amongst diagnostic modalities for the presence and type of infection was calculated as the number of concordant cases divided by the total number of cases (concordant + discordant), which was further classified into bacterial, fungal, and mycobacterial categories. Tissue cultures were considered negative if they exhibited no growth, contamination, or expansion of skin flora, and positive if they generated at least one identifiable organism. The results of histopathology tests were classified as negative if the pathologist suggested a low likelihood or no worry for infection, and positive if the pathologist reported a definitive diagnosis or a high risk of infection. Histopathology findings that were positive for many types of infection or for an infection without a type specificity were considered consistent with positive tissue cultures.

Secondary outcome measures included the rate of concordance between the final clinical diagnosis and the results of tissue culture and histology testing. If the final clinical diagnosis agreed with either the tissue culture or the histology results, it was considered concordant.

Statistical analysis: SPSS version 22 was used to analyse the data. Baseline demographic factors were characterized as frequency distributions. Chi-square test was employed to evaluate comparisons stratified by concordance status for categorical variables.

RESULTS

Details of the demographic data were presented in Table 1. The mean age of the participants was 53.2 ± 13.12 years. There were 36 males and 24 females

TABLE 1: BASELINE CHARACTERISTICS

characteristic	value		Number of cases (n=60)
Age (years)	Mean $\pm$ SD	53.2 $\pm$ 13.12	-
Sex			
Male	%	60	36
Female	%	40	24

The overall consistency between histology and tissue culture data was strong for suspected SSTIs (77.5%). Concordance rates were not substantially impacted by age, gender, antibiotic usage, immunosuppressive status, or tissue sample size. The kind of infection influenced the concordance of tissue culture and histology results. There was a high concordance between tissue culture and histopathology for cases with no evidence of infection, fungal infection, and mycobacterial infection by histopathology and by tissue culture as shown in Table 2.

TABLE 2: CONCORDANCE OF HISTOPATHOLOGY AND TISSUE CULTURE RESULTS.

characteristic	Total cases (n=60)	Discordant cases (n=20)	Concordant cases (n=40)	p value
Sex				
Male	36	12 (60%)	24 (60%)	0.142
Female	24	8 (40%)	16 (40%)	
Antimicrobial medications, n (%)	50	16 (80%)	34 (85%)	0.752
Immunosuppressed, n (%)	50 (83%)	17 (85%)	33 (85%)	0.912
Biopsy tissue size, mm				
≤4	33 (55%)	11 (55%)	22 (55%)	0.764
≥5	27 (45%)	9 (45%)	18 (45%)	
Histopathology results, n (%)*				
No infection	48 (80%)	10 (21%)	38 (79%)	
Infection	12 (20%)	4 (33%)	8 (77%)	
Bacterial infection	4 (33%)	1 (25%)	3 (75%)	
Fungal infection	5 (43%)	1 (25%)	4 (75%)	
Mycobacterial infection	1 (8%)	1 (100%)	0 (0%)	
Infection, not otherwise specified	2 (16%)	1 (50%)	1 (50%)	
Tissue culture results, n (%)*				
Negative culture	42 (70%)	3 (7%)	39 (93%)	
Positive culture	18 (30%)	10 (55.5%)	8 (44.5%)	
Bacterial culture	11 (61%)	7 (63%)	4 (27%)	
Fungal culture	5 (28%)	2 (40%)	3 (60%)	
Mycobacterial culture	2 (11%)	1 (50%)	1 (50%)	

DISCUSSION

Our research found a 77.5% concordance between tissue culture and histological evaluation of suspected SSTIs, which is consistent with earlier findings for deep cutaneous fungal infections and suspected SSTIs in mostly outpatient settings [6]. However, we discovered that the concordance between tissue culture and histology varied by infection type, with worse concordance for suspected SSTIs with bacterial infection. The higher rates of discordance for bacterial infections may indicate a greater difficulty in detecting bacterial pathogens via histological investigation. This might be explained by gram staining's limited sensitivity for typical bacterial SSTIs, especially when antimicrobial treatments break gram-positive species' cell walls or during tissue processing [12]. Overall, the poor concordance rates between tissue culture and histopathology testing for bacterial infections highlight the necessity of clinical context in establishing the value of diagnostic testing for SSTIs in these individuals.

Previous research suggests that tissue cultures in immunosuppressed and antimicrobial-treated patients have

limited diagnostic usefulness due to a poor yield of genuine positive cultures [11]. In contrast to previous investigations, we discovered that the frequencies of positive tissue cultures and tissue culture concordance with histopathology tests were not substantially different dependent on immunosuppressive state or antibiotic usage. The size of the biopsy and the patient's age had no effect on the concordance rates.

CONCLUSION

This study found high concordance between histopathology and tissue culture for suspected SSTIs with no clinical indication of infection, including fungal and mycobacterial SSTIs.

REFERENCES

1. Lipsky BA, Moran GJ, Napolitano LM, Vo L, Nicholson S, Kim M. 2012. A prospective, multicenter, observational study of complicated skin and soft tissue infections in hospitalized patients: clinical characteristics, medical treatment, and outcomes. *BMC Infect Dis* 12:227
2. Stevens DL, Bisno AL, Chambers HF, Everett ED, Dellinger P, Goldstein EJC, Gorbach SL, Hirschmann JV, Kaplan EL, Montoya JG, Wade JC, Infectious Diseases Society of America. 2005. Practice guidelines for the diagnosis and management of skin and soft-tissue infections. *Clin Infect Dis* 41:1373–1406.
3. Ki V, Rotstein C. 2008. Bacterial skin and soft tissue infections in adults: A review of their epidemiology, pathogenesis, diagnosis, treatment and site of care. *Can J Infect Dis Med Microbiol* 19:173–184.
4. Stevens DL, Bisno AL, Chambers HF, Dellinger EP, Goldstein EJC, Gorbach SL, Hirschmann JV, Kaplan SL, Montoya JG, Wade JC. 2014. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the infectious diseases society of America. *Clin Infect Dis* 59:147–159.
5. Eron LJ, Lipsky BA, Low DE, Nathwani D, Tice AD, Volturo GA, Expert panel on managing skin and soft tissue infections. 2003. Managing skin and soft tissue infections: expert panel recommendations on key decision points. *J Antimicrob Chemother* 52(Suppl 1):i3–i17.
6. Gonzalez Santiago TM, Pritt B, Gibson LE, Comfere NI. Diagnosis of deep cutaneous fungal infections: Correlation between skin tissue culture and histopathology. *J Am Acad Dermatol* 2014;71(2):293–301.
7. Esposito S, Noviello S, Leone S. Epidemiology and microbiology of skin and soft tissue infections. *Curr Opin Infect Dis* 2016;29(2):109–15.
8. Stevens DL, Bisno AL, Chambers HF, Dellinger EP, Goldstein EJC, Gorbach SL, Hirschmann JV, Kaplan SL, Montoya JG, Wade JC. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 Update by the Infectious Diseases Society of America. *Clin Infect Dis* 2014;59(2):10–52.
9. Drinka P, Bonham P, Crnich CJ. Swab culture of purulent skin infection to detect infection or colonization with antibiotic-resistant bacteria. *J Am Med Dir Assoc* 2012;13(1):75–9.
10. Fan Di Xia, Song P, Joyce C, Mostaghimi A. The utility of microbiological studies in diagnosis and management of suspected dermatological infection. *JAMA Dermatol* 2017;153(11):1189
11. Woods GL, Walker DH. Detection of infection or infectious agents by use of cytologic and histopathologic stains. *Clin Microbiol Rev* 1996;9(3):382–404.
12. Wilson ML, Winn W. Laboratory diagnosis of bone, joint, soft-tissue, and skin infections. *Clin Infect Dis* 2008; 46(3):453–7.