

Assessment of MSIS Diagnostic Criteria as Predictors of Treatment Success in Total Knee Arthroplasty (TKA) Infections Treated with Two-Stage Exchange

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Abstract

Background: Prosthetic joint infection (PJI) is a grave complication of total knee arthroplasty (TKA). Predicting outcome is difficult. Musculoskeletal Infection Society (MSIS) criteria are sensitive and specific for the diagnosis of PJI. In prior work, we systematically studied the value of each MSIS criterion as a prognostic marker among a large cohort of patients with infected hip and knee arthroplasty treated with debridement, antibiotics, and implant retention (DAIR) at our specialized orthopedic hospital. We found that sinus tract drainage and culture positivity predicted explantation within two years of DAIR; the minor MSIS criteria were not predictive. Here, we sought to evaluate the utility of MSIS criteria in predicting outcomes of infected TKR PJI treated with two-stage exchange arthroplasty. We sought to evaluate whether MSIS criteria can predict outcome of infected TKR PJI treated with two-stage exchange arthroplasty.

Methods: A retrospective cohort of PJI from 2009-2014 treated with two-stage exchange was identified via an administrative database. 2-year

implant retention was the primary outcome. Collected data included demographics and comorbidities, duration of symptoms, implant age, and pathogen. Continuous variables were assessed using the Mann-Whitney-U tests and categorical variables using the Chi-square test and Fisher's exact test when appropriate.

Results: 159 patients who underwent 2-stage exchange for TKA PJI meeting MSIS criteria were identified. 116 patients (73%) remained infection free after two years of observation. Neither of the major criteria [presence of sinus drainage ($p=0.593$), and >1 positive culture ($p=0.9792$)], nor any of the minor criteria, reached statistically significant association with treatment outcome.

Conclusion: Individual MSIS diagnostic criteria, which do have prognostic utility in knee PJI treated with DAIR, may not be powerful predictors of outcome of knee PJI after two-stage exchange.

Objectives

Prognostic tools may help clinical decision making in the management of prosthetic joint infections.

In prior studies:

- We systematically studied MSIS criteria as markers for patients with infected hip and knee arthroplasty treated with debridement, antibiotics, and implant retention (DAIR). Sinus tract drainage and culture positivity predicted explantation within two years of DAIR. Minor MSIS criteria were not predictive.
- In hip patients treated with two-stage exchange, no criteria were predictive.

Aim of Project

- Evaluate the utility of MSIS criteria in predicting outcomes of TKR PJI treated with two-stage exchange.

MSIS Criteria

- There is a sinus tract communicating with the prosthesis; or
- A pathogen is isolated by culture from at least two separate tissue or fluid samples obtained from the affected prosthetic joint; or
- Four of the following six criteria exist:
 - Elevated serum erythrocyte sedimentation rate (ESR) and serum C-reactive protein (CRP) concentration,
 - Elevated synovial leukocyte count,
 - Elevated synovial neutrophil percentage (PMN%),
 - Presence of purulence in the affected joint,
 - Isolation of a microorganism in one culture of periprosthetic tissue or fluid
 - Greater than five neutrophils per high-power field in five high-power fields observed from histologic analysis of periprosthetic tissue at $\times 400$ magnification.

PJI may be present if fewer than four of these criteria are met.

Methods

Retrospective cohort study

Data source: Hospital for Special Surgery (HSS) Infection Database

- All arthroplasty infections between 2009-2014

Inclusion: TKA PJI treated with two-stage and 2-yr follow-up

Data collection: demographic, surgical, microbiological, pharmacy, co-morbidities

Primary outcome: prosthesis retention for 2 years from initial reimplantation

Analysis:

- Mann-Whitney U tests for continuous variables
- Chi-square test and Fisher's exact test for categorical values

Results

- 159 patients met MSIS criteria for TKA PJI and underwent 2-stage exchange
- 116 patients (73%) remained infection-free after two years of observation.
- Major MSIS Criteria had no statistically significant association.
 - Presence of sinus drainage ($p=0.593$)
 - >1 positive culture ($p=0.9792$)
- Minor Criteria had no statistically significant association.

Summary of Patient Characteristics

	All cases	Success	Failure
Age (yr)	66 (43,74) n=159	67 (60,73) n=116	66 (56,77) n=43
BMI	30(26, 34) n=155	30(27,34) n=113	29(25,34) n=42

All statistics as median "[first quartile, third quartile]"

Summary of MSIS Criteria for Successful Cases

	Success with criteria met (%)	Success with criteria not met (%)	p-value
MSIS 1 Presence of sinus drainage	73	22	0.59
MSIS 2 >1 positive cultures	73	27	0.97
MSIS 3a Elevated ESR or CRP	100	0	0.15
MSIS 3b Elevated synovial WBC	50	50	0.29
MSIS 3c Elevated synovial PMN	67	33	0.61
MSIS 3d Purulence	73	27	0.49
MSIS 3e One positive culture	86	14	0.68
MSIS 3f >5 neutrophils per HPF	72	28	0.70

Conclusions

Individual MSIS diagnostic criteria (which do have prognostic utility in knee PJI treated with DAIR) are not powerful predictors of outcome of knee PJI after two-stage exchange.

References

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