The 2018 ICM Definition of Periprosthetic Hip and Knee Infection has Limited Value in Determining the Outcome of Reimplantation in Two-Stage Revision

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INTRODUCTION: Determining infection control before reimplantation in a two-stage revision is still a challenging endeavor. Given the pitfalls of 2013 MSIS criteria of periprosthetic joint infection (PJI) in this setting (low sensitivity), new 2018 ICM PJI definition was proposed. However, its accuracy to confirm control of infection and anticipate the outcome of reimplantation is unknown. Thus, in the current study, our objectives were 1) to evaluate the accuracy of 2018 ICM PJI definition to diagnose residual infection at the time of reimplantation and 2) predict the outcome of reimplantation.

METHODS: A retrospective review was done on a consecutive series of 134 two-stage hip or knee revisions indicated for the treatment of PJI, which were performed by 16 surgeons in two institutions (2014 to 2020). The inclusion criteria comprised the completion of reimplantation, tests for 2018 ICM PJI definition, and minimum 1-year follow up. Patients with "inconclusive" 2018 ICM PJI definition scores were excluded. Thus, 123 two-stage revisions (49 hips and 74 knees) were included. Based on the weighted scoring system, all cases were categorized into either 2018 ICM positive (+) (score ≥6) or negative (-) (score ≤3). The outcome of reimplantation was defined by MSIS outcome-reporting tool: success (MSIS Tier 1 and 2 (infection control with/without antibiotics)), and failure (MSIS Tier 3 (aseptic or septic revision) and 4 (death)). Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated. Receiver operating characteristic curve and Kaplan Meier survival analysis with log-rank test were performed.

RESULTS: There were no significant differences in baseline characteristics between 2018 ICM (+) and 2018 ICM (-) two-stage revisions. Also, mean follow-up duration was not significantly different between the groups (26.2 months vs. 21.8 months; p=0.402). The 2018 ICM definition demonstrated poor sensitivity (16.6%) and PPV (43.7%), but high specificity (88.8%) to determine infection control before reimplantation (Table 1). The area under the curve was 0.472, depicting no ability at all to differentiate successful (MSIS Tier 1 and 2) two-stage revisions from failed ones (MSIS Tier 3 and 4) (Figure 1). On survival analyses, there were no significant differences in failure-free survival between 2018 ICM (+) and 2018 ICM (-) surgeries (33.3 months vs. 46.1 months; p-value=0.343) (Figure 2).

DISCUSSION AND CONCLUSION: 2018 ICM PJI definition demonstrates minimal value to anticipate the outcome of reimplantation, and seems to fail at the same objective the previous 2013 ICM criteria did, prediction of survival of reimplantation in a two-stage revision.

Figure 1. Receiver operating characteristic (ROC) curve depicting poor accuracy of 2018 ICM PJI definition to diagnose residual infection at the time of reimplantation and determine eventual outcome (area under the curve=0.472).

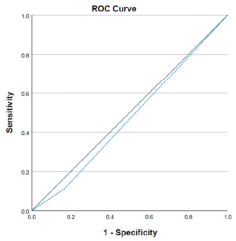

Figure 2. Survival analyses of two-stage revisions based on the 2018 ICM PJI definition at minimum 1-year follow up (log rank test; p-value=0.343).

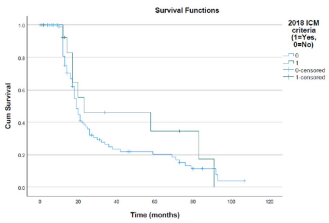

Table 1. Results of 2018 ICM definition of periprosthetic hip and knee infection in determining the outcome of reimplantation in a two-stage revision.

	MSIS Tier 1/2 (-)	MSIS Tier 3/4 (+)	Total
2018 ICM (-)	72	35	107
2018 ICM (+)	9	7	16
Total	81	42	123

Accuracy = 100 x 7+72/7+72+9+35 = **64.2%**
Sensitivity = 100 x 7/42 = **16.6%**
Specificity = 100 x 72/81 = **88.8%**
Positive predictive value = 100 x 7/16 = **43.7%**
Negative predictive value = 100 x 72/107 = **67.2%**
Positive Likelihood Ratio = 0.166/1-0.888 = **1.48**
Negative Likelihood Ratio = 1-0.166/0.888 = **0.94**