

Results of lymphocyte transformation testing in known cases of PJI

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Significance & Hypothesis/Techniques: Periprosthetic joint infections (PJI) occur after primary total joint arthroplasty (TJA) with an incidence between 0.5-3%. PJI was diagnosed according to the criteria established in the 2018 Consensus Report from MSIS. Recently, 16S DNA Next Generation Sequencing (NGS) has been added to make the diagnosis of PJI. The advantage of NGS is that it identifies multiple species, not limited to bacteria, as well as resistant genes. With the use of the NIH genetic library, over 56,000 genes for bacteria and viruses can be utilized, along with bacterial resistance. Similar to PJI patients, who often have some immuno-compromising factors, patients with metal-ion hypersensitivities (MIH) have a defect mediated through lymphocytes and histiocytes, characteristic of a Type IV hypersensitivity immune response. We hypothesized that PJI is more common in patients presenting with MIH.

Innovation: This study integrates advanced molecular diagnostics (NGS) with immunologic testing (LTT) to evaluate a potential association between MIH and PJI. By combining these two tools, this work aims to better characterize infection risk in a subset of patients with altered immune responses and identify a potential unexplored risk factor for PJI.

Approach: In this retrospective study, 91 patients with lymphocyte transformation test (LTT) confirmed MIH between 2018 and 2022, and draining sinus tracts were evaluated using NGS obtained from aspiration samples. Another group of 68 patients with PJI and positive NGS findings was tested for MIH through LTT. All patients, prior to any surgical intervention, were staged with a tri-phase bone scan, white blood cell scan, and a CT scan with millimeter cuts of the appropriate joint.

Results: Of the 91 patients diagnosed with MIH by LTT testing, 19 patients were diagnosed with PJI and had organisms detected with NGS (20.88%). This is significantly greater than the prevalence of PJI in the general population, 0.73% (73/9973), according to Fisher's exact test ($p < .0001$). Conversely, out of the 68 patients diagnosed with PJI confirmed by NGS and Consensus criteria, 9 patients (13.24%) tested positive for MIH by LTT. This proportion is similar to the prevalence of MIH in the general population (1.5 -11.4%) without a statistically significant difference.

Discussion & Impact: Patients with TJA complicated by MIH seem to have a greater incidence of PJI compared to TJA patients in the general population. While this may indicate MIH as a potential risk factor for PJI, the many etiologies of PJI following TJAs account for the similar prevalence of MIH seen in our PJI cohort and the general population. Based on the above data, LTT screening prior to revision TJAs is warranted to mitigate revision surgeries for infection, though the exact relationship between MIH and PJI remains an area for further investigation.