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Evaluation of antibiotic and cell-based therapy in preventing S. epidermidis-induced nonunion in rats.

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Abstract

Methicillin-resistant *S. epidermidis* (MRSE) is responsible for biofilm-related infections (Montanaro, 2011; Romanò, 2013) and fracture nonunion, as recently demonstrated by our group (Lovati, 2016).
The present study aims to investigate the efficacy of antibiotic or cell-based therapies in preventing bacterial infections and nonunion establishment.
Under anesthesia, femoral fractures were performed in 30 rats, then the site of injury was injected with a clinical-derived MRSE strain and, finally, synthesized with stainless steel plates. Rats were differently treated as follows: MRSE-infected controls (IC); systemically-injected vancomycin (s-VANC); local vancomycin-enriched hydrogel (l-HYD); systemically-injected BMSCs (s-BMSCs); and locally-injected BMSCs (l-BMSCs).
After 6 weeks, pro-inflammatory cytokines, quantitative micro-CT, histological and microbiological analyses were carried out to investigate the host response to the different treatments.
Half of the s-BMSCs rats died closely to the systemic cell injection, thus excluded for further analyses. Our results for the IC group were consistent with previously published data (Lovati, 2016), showing signs of osteomyelitis and nonunion development. In s-VANC and l-HYD groups, micro-CT detected a good bony bridging and the microbiological counts were significantly lower with respect to the other groups. Our study suggests that the association of s-VANC and l-HYD is an effective treatment to prevent biofilm-induced nonunions. Differently, we cannot positively support cell therapies for this purpose due to the high risk related to the systemic cell injection, thus requiring further studies to be eventually proposed in clinics.

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