

Anti-bacterial hydrogel coating of osteosynthesis implants. Early clinical results from a multi-center prospective trial.

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INTRODUCTION: Infection after osteosynthesis remains a feared complication in trauma surgery. Various antibacterial coatings for implanted biomaterials are under study, aimed at reducing bacterial colonization and biofilm formation; however, only few technologies are currently available in the clinical setting. *In vitro* and *in vivo* studies have demonstrated the safety and efficacy of a fast resorbable (<96 h) antibacterial-loaded hydrogel coating (DAC®, Novagenit Srl, Italy), that can be applied intra-operatively and has recently received the CE mark. Here we present the first clinical results of a multi-center prospective trial, performed on vancomycin-loaded DAC in trauma patients, under the European 7th Framework Programme (collaborative research project number 277988).

METHODS: In this prospective, controlled, single blind study, 98 patients (37 in Italy, 32 in Greece and 19 in Austria), undergoing internal osteosynthesis for closed fractures, were randomly assigned to receive vancomycin-loaded DAC coating or to a control group, without coating. The study was approved by local Ethical Committee and all patients gave their written informed consent. Pre- and post-operative assessment of laboratory tests, wound healing (ASEPSIS score), clinical score (SF-12 score) and x-rays was performed at fixed time intervals, by a blind investigator. Statistical analysis was performed with Fisher exact test or Student's t test as appropriate. Significance level was set at $p < 0.05$.

RESULTS: On average, wound healing, clinical scores, laboratory tests and radiographic findings did not show any significant difference between the two-groups at a mean 6 months follow-up (min: 3, max: 15 months). Two early infections of the surgical site, treated with antibiotic therapy in one case and with early hardware removal and external fixation in the other were observed in the control group. No local or systemic side effects, that could be related to DAC hydrogel coating, were noted. In particular, no radiological signs of interference with bone healing were noted.



Fig. 1: Vancomycin-loaded DAC hydrogel application on an internal plate for osteosynthesis of an ankle fracture. *In vivo* studies showed a > 99% bacterial load reduction in a model of highly contaminated intra-medullary nail in the rabbit.

DISCUSSION & CONCLUSIONS: This study shows that a novel, fast-resorbable anti-bacterial hydrogel coating can be safely used in patients undergoing internal osteosynthesis for closed fractures. Further studies are needed to confirm in the clinical setting the efficacy of the coating to effectively prevent implant-related infections, as previously successfully tested in animal models.

REFERENCES: ¹ Drago L., Boot W, Dimas K, et al.. (2014) Does implant coating with antibacterial-loaded hydrogel reduce bacterial colonization and biofilm formation *in vitro*? *CORR* **472**; 3311-3323. ² Giavaresi G, Meani E, Sartori M, et al.. (2014) Efficacy of antibacterial-loaded coating in an *in vivo* model of acutely highly contaminated implant. *Int Orthop* **38**:1505-12.

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