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Porous alumina ceramic as a vector for local antibiotic delivery

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Background: Local antibiotic delivery can be a great way of antibiotic administration. Indeed, diffusion of antibiotic varies from one antibiotic to another and from one organ to another. In orthopedic surgery bone cement are used but only a small amount of the loaded antibiotic is released (about 10% in the literature) eventually leading to emergence of resistance. Other devices are use such as collagen sponges. In the literature, local dosages are scarce as it is difficult to realize sample *in vivo*. We report local dosages, in a patient who received an antibiotic loaded ceramic for sternum replacement.

Material/methods: A patient presenting a deep sternal wound infection with a complete destruction of his sternum received an alumina porous ceramic prosthesis loaded with gentamicin. The total amount of gentamicin loaded in the prosthesis was around 350 mg. Local samples were performed at H1 and H24 thanks to redon drain that was placed above a muscular flap covering the ceramic implant. In parallel, blood samples were performed to assess the possible systemic toxicity of high local doses that would reach blood vessels.

Results: Local concentrations were 1,400 mg/L at H1 and 395 mg/L at H24. No gentamicin was found in blood samples from H1 to H48. This result was previously found in another patient.

Conclusions: Local delivery achieves very high local concentrations of gentamicin. If we compare it to the once that is efficient (C_{max}/MIC > 8) and with a bacteria which have an MIC of 1 µg/ml, the local obtained concentrations are 175 times the dose required at H1 and 50 times the dose required at H24. The results of blood samples demonstrate that there is no risk for kidney function as there is no residual dose. This type of administration using a ceramic allows a high local dose from the beginning of implantation which protects the procedure to avoid a wound and implant infection. Further studies are required to assess the bacteriological *in vivo* efficacy of this route of administration.