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## Clinical and cost-effectiveness evidence of S53P4 bioactive glass in the eradication of osteomyelitis

Jacobus J C Arts<sup>1,2</sup><sup>1</sup>Maastricht University Medical Centre, Netherlands<sup>2</sup>Eindhoven University of Technology TU/e, Netherlands

**Introduction:** S53P4 bioactive glass is a novel biodegradable antibacterial bone graft substitute that enables a one-stage surgery in local chronic osteomyelitis treatment. This study assessed eradication of infection and bone healing capacities of S53P4 bioactive glass in a cohort of 25 osteomyelitis patients. Secondly, we performed a cost-effectiveness analysis of two-stage surgery with PMAA antibiotic beads versus one-stage with S53P4 bioactive glass in a cohort of 37 patients.

**Methods:** All patients with clinically, haematologically and radiologically evident chronic osteomyelitis were included and treated with extensive debridement surgery, S53P4 bioactive glass implantation and systemic antibiotic administration. Primary endpoint was eradication of infection based on clinical, blood samples and radiological outcomes. Secondly, we conducted a retrospective cohort study and all patients with chronic osteomyelitis in long bones, who received one of two treatment algorithms, from 2006 until 2015 were included. All hospital-related costs from diagnosis until one year postop were clarified and compared. Patient outcomes were eradication of infection based on blood analysis, X-ray imaging and clinical outcomes.

**Results:** Between 2011-2016, 25 patients were included with a mean follow-up of 23 months (4–57). Hospital stay was short with a mean of 18 days (4–40) and patients required an average of 1.4 surgeries (1–4). The inflammatory parameter C-reactive protein (CRP) showed normalization after a mean duration of 46 days. At the end of follow-up haematological and clinical outcomes showed eradication of infection in 24 (96%) of all patients. Radiological assessment showed that none of all patients exhibited persisting signs of infection and bone healing was observed in 22 (88%) patients based on

changes on conventional radiology. A total of 37 patients are included in the costeffectiveness study, based on treatment 16 patients were allocated to the S53P4 group and 21 to the control group. These groups were not significantly different at baseline. We observed a decrease in hospitalization days of 14 days ( $p<0.001$ ) and the number of surgeries decreased from 2.33 to 1.25 ( $p<0.001$ ). Despite the higher material costs versus €2.132,50 to €362,97 ( $P=0.004$ ), we observed total costs of €18.586,49 in the treatment group versus €27.134,96 in the control group. Eradication of infection is seen in 100% of patients in the treatment group compared to 76% in the control group ( $p=0.066$ ). The combination of the total costs and the success rates of these two treatments result in an incremental cost-effectiveness ratio (ICER) of €-35.618,63/successfully treated patient.

**Discussion:** Based on the results of our clinical experience, S53P4 bioactive glass can successfully be used in a one-stage procedure for treatment of chronic osteomyelitis. Eradication of infection was successful in almost all patients and so far no patients required a second surgery due to infection recurrence. Bone healing was seen in all patients except for the patients with an initial infected non-union fracture. This study shows a cost effectiveness of S53P4 bioactive glass in one-stage surgical treatment of chronic osteomyelitis.

### Speaker Biography

Jacobus J C Arts has completed his PhD from Radboud University Medical Centre. Currently, he is appointed as Associate Professor of Translational Biomaterial Research at Maastricht UMC and Eindhoven University of Technology in the Netherlands. His research focuses on biomaterials for bone healing, infection treatment and spinal deformity. He has published more than 50 papers in peer-review journals and has been serving in several national in international biomaterials education and interest groups.

e: j.arts@mumc.nl



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