

Executive Summary

Publication	How to prevent implant failure in modular stems? <u>Krüger D¹</u>, Guenther KP², Deml MC³, Perka C⁴. Lecture at the 13th Endoprothetik Kongress, session 7 „Revision hip arthroplasty“, 14th February 2020, Berlin (Germany) ¹Herzogin Elisabeth Hospital, Brunswick (Germany) ²University Hospital Carl Gustav Carus, Dresden (Germany) ³Inselspital, University Hospital, Bern (Switzerland) ⁴Charité, Center for Musculoskeletal Surgery, Berlin (Germany) The paper was accepted for publication in <i>The Bone & Joint Journal</i> in February 2020. https://online.boneandjoint.org.uk/journal/bjj
Study	Evaluation of a large database with reported mechanical failure of a cementless modular stem for revision hip arthroplasty and comparison with a control group treated with the same implant. Level of Evidence III
Implant	Cementless modular revision stem MRP-TITAN (PETER BREHM GmbH)
Patients	Study group: 113 reported cases with failed revision stem Control group: n=159 (163 hips)
Follow-up	Study group: 113 cases with failed revision stem between 2008 and 04/2017 Control group: Ø 10 years (range, 5-16)
Method	The scientists used a large database (PETER BREHM GmbH) containing patient demographic data, time to failure and implant details for all reported cases with failed revision stems. They identified all cases in the time period between 2008 and April 2017. The number of 37,600 MRP-TITAN revision stems sold between 2008 and April 2017 was used to calculate the fracture rate. Surgical, patient and implant-related risk factors were evaluated using a regression analysis with multiple imputation procedure and compared to a control group, where no fractures had been observed. Results of retrieval analysis of fractured implants, which had been performed by the manufacturer, were available for analysis. Patient-related data (age, gender, height, weight, BMI) were analysed for statistical significance between the two groups (Mann-Whitney-U-Test). The statistical analysis was performed using the IBM SPSS Statistics software (IBM Corp.). Implant-related data (type, size, diameter, offset) were analysed.
Results	Between 2008 and April 2017, 113 cases of fractured revision stems were reported. The speaker underlined that, given the high complexity of the revision cases, the overall fracture rate of 0.3% appears low. The fracture rate without cases of improper use was 0.1%. In all cases, the fracture was located at the taper modular junction or the taper of the extension sleeve. Implantation, patient (obesity, male gender) and implant-related (lateralized and short neck segments) risk factors were discussed. Signs of improper use of the implant during implantation were insufficient assembly of the modular taper junction, off-label use of an extra long head ≥XL or a head from

	another company and macroscopically visible taper contamination (blood, bone or soft tissue). Missing TiN wear (TiN coating) at the screw M6 was seen indicating insufficient tightening of the screw with required torque during implantation (inadequate securing of the taper junction).
Key Points	The defect reconstruction in complex hip revision cases often necessitates the use of modular stems under suboptimal conditions. How to prevent implant failure? The speaker summarized the results as follows: • Implantation instructions and contraindications need to be respected. • Mind patient and implant specific risk factors. • Whenever possible, short and lateralized neck segments should be avoided. • Worst case scenario: obese patient with short and lateralized neck segment, extra long head and insufficient assembly of the modular components. • Informing patients about specific risk factors, especially in obese patients. The advantage of modular stems is the adequate restoration of the biomechanical parameters and intraoperative adaption to the anatomical situation, especially in complex revision cases. Thus, there was consensus that modular stems cannot be replaced by monobloc stems in hip revision surgery. The take home message was: Use modular stems correctly!
Abbreviations	BMI - body mass index, TiN - titanium nitride