

## **Influence of the variation of the operator, patient position and device on the measurement performance of Radiofrequency Echographic Multi Spectrometry (REMS)**

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### **INTRODUCTION:**

The monitoring of bone mineral density (BMD) is a key aspect for patients undergoing pharmacological treatments that might cause BMD changes at non-physiological rates. At present, the short-term follow-up of patients under treatment in terms of BMD change with time remains an unmet clinical need, since the current techniques, including the gold standard dual X-ray absorptiometry (DXA), require at least 1 year between two consecutive measurements [1]. Therefore, an effective strategy for the assessment of BMD should guarantee high accuracy, precision and repeatability of the measurements.

### **OBJECTIVE:**

The aim is to assess the influence of the variation 1.) in patient position, 2.) operator (both intra- and inter-) and 3.) device on the REMS performance at lumbar spine and femoral neck.

### **METHODS:**

210 women were enrolled, divided in 7 groups of 30-patient each for the assessment of the parameters of interest, i.e. inter-device, intra- and inter-operator repeatability for lumbar spine scans and inter-patient position, inter-device, intra- and inter-operator repeatability for femoral neck scans.

All patients underwent 2 REMS scans at lumbar spine or femoral neck, performed by the same operator or by 2 different operators or by the same operator using 2 different devices or in different patient position (i.e. supine without constraints or with a constrained 25°-rotation of the leg). The percentage coefficient of variation (CV%) with 95% confidence interval and least significant change for a 95% confidence level (LSC) have been calculated.

### **RESULTS:**

For lumbar spine, intra-operator repeatability resulted in CV%=0.37% (95%CI: 0.26%-0.48%), with LSC=1.02%, inter-operator repeatability resulted in CV%=0.55% (95% CI: 0.42%-0.68%), with LSC=1.52%, inter-device repeatability resulted in CV%=0.53% (95% CI: 0.40%-0.66%), with LSC=1.47%.

For femoral neck, intra-operator repeatability resulted in CV%=0.33% (95%CI: 0.23%-0.43%), with LSC=0.91%, inter-operator repeatability resulted in CV%=0.47% (95% CI: 0.35%-0.59%), with LSC=1.30%, inter-device repeatability resulted in CV%=0.42% (95% CI: 0.30%-0.51%), with LSC=1.16%, inter-patient position repeatability resulted in CV%=0.24% (95% CI: 0.18%-0.30%), with LSC=0.66%.

**CONCLUSION:**

REMS densitometry is highly precise for both anatomical sites, showing high performance in repeatability. These results suggest that REMS is a suitable technology for short-term monitoring. Moreover, thanks to its ionizing radiation-free approach, it might be applied for population mass investigations and prevention programs also in paediatric patients and pregnant women.