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This booklet is a curated collection of abstracts presented at the World Congress on Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (WCO-IOF-ESCEO) held in Prague, Czech Republic, from April 16-19, 2026.

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WORLD CONGRESS ON OSTEOPOROSIS, OSTEOARTHRITIS AND MUSCULOSKELETAL DISEASES

2026 Prague

Abstract Book

IOF-WCO 2026 Prague: Abstracts

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OC16 PREGNANCY-RELATED CHANGES IN BONE HEALTH: A LONGITUDINAL REMS-BASED STUDY

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Objective(s): Pregnancy-related increases in calcium requirements may lead to enhanced bone resorption, resulting in substantial reductions in bone mineral density (BMD), and a higher risk of osteoporosis. Current evidence in literature report that pregnant women can show a BMD reduction up to 9%. As standard densitometric technologies, such as dual-energy X-ray absorptiometry (DXA), involve exposure to ionising radiation, their use is not recommended during pregnancy. Therefore, the present study aimed to investigate pregnancy-related changes in bone density and microarchitecture using the Radiofrequency Echographic Multi-Spectrometry (REMS) technology.

Materials and Methods: Inclusion criteria encompassed Caucasian pregnant women at first trimester who underwent REMS scans of femoral neck. Patients were re-assessed at the third trimester. By automatically combining bone quantity (REMS-T-score) and quality (REMS-FS) parameters, patients were classified into one of the 7 risk classes (named from R1 to R7), each corresponding to an increasing probability of imminent (within 5-year) fragility hip fractures. Changes in bone-related parameters over time were evaluated using paired t-tests.

Results: In total, the analysis included 46 pregnant women (aged 26 - 49 years; BMI 16.59–29.76 kg/m²). Comparison over time revealed a significant deterioration in both bone-related parameters: the mean T-score, in fact, decreased from −1.1 ± 0.7 to −1.3 ± 0.7 ($p < 0.0001$), and the mean FS increased from 41.70 ± 5.68 to 46.39 ± 8.33 ($p = 0.0006$). Furthermore, 55% of the participants shifted from a lower to a higher risk class.

Conclusion(s): Overall, the results demonstrate that pregnancy is associated with a deterioration in bone density and microarchitectural integrity, which together increases the risk of fragility fractures. In this context, REMS technology represents a safe, radiation-free and noninvasive approach that enables early identification of women at higher risk and monitoring over time, thus supporting targeted preventive strategies.

NSS29 HIGH PREVALENCE OF OSTEOPOROSIS IN AUTOIMMUNE AND INFLAMMATORY DISEASES

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Background: Osteoporosis is a frequent yet often under-recognized comorbidity in autoimmune and inflammatory diseases. Chronic systemic inflammation, immune-mediated bone resorption, prolonged exposure to glucocorticoids, reduced physical activity and disease-related disability all contribute to impaired bone strength and increased fracture risk. Despite this, osteoporosis screening and fracture prevention strategies remain inconsistently implemented in routine care.

Aim To highlight the prevalence, pathophysiological mechanisms and clinical relevance of osteoporosis in autoimmune and inflammatory diseases, emphasising the need for systematic bone health assessment in these populations.

Methods: A narrative review of epidemiological studies, pathophysiological research and international guidelines addressing bone loss and fracture risk in inflammatory and autoimmune conditions.

Results: Evidence consistently shows increased rates of low bone mass and fractures in autoimmune and inflammatory diseases. Chronic inflammation stimulates osteoclast activity and suppresses osteoblast function through cytokines such as TNF-α and IL-6, leading to microarchitectural deterioration. Long-term corticosteroid therapy further increases fracture risk even when BMD is not severely reduced. In ankylosing spondylitis (AS), spinal BMD can be falsely elevated on DXA due to ossification. REMS, a non-ionizing ultrasound-based technique, demonstrates excellent precision, allowing detection of smaller BMD changes over shorter intervals and offering potential advantages, particularly in patients with artifacts such as degenerative changes or spinal alterations in AS. Furthermore, REMS-derived Fragility Score may better predict incident osteoporotic fractures than T-scores from either REMS or DXA.

Conclusion: Osteoporosis is highly prevalent in autoimmune and inflammatory diseases because of the combined effects of chronic inflammation and corticosteroid therapy, yet current diagnostic approaches frequently fail to detect early deterioration in bone quality. REMS may help bridge this diagnostic gap and support earlier intervention, although further prospective studies are required.

Key words: osteoporosis, prevalence, autoimmune, inflammatory diseases

NSS30 CLINICAL CHALLENGES AND DIAGNOSTIC GAPS IN OSTEOPOROSIS ASSESSMENT: THE ROLE OF REMS TECHNOLOGY

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Background: Conventional osteoporosis diagnostics, particularly dualenergy X-ray absorptiometry (DXA), may be limited in patients with inflammatory diseases and in special clinical settings such as pregnancy. Positioning difficulties, skeletal deformities, artefacts, cumulative radiation exposure and safety concerns can compromise diagnostic accuracy and feasibility, leading to underdiagnosis of bone fragility.

Aim To discuss current diagnostic gaps in osteoporosis assessment in inflammatory diseases and pregnancy and to explore the potential role of Radiofrequency Echographic Multi-Spectrometry (REMS) as an alternative imaging approach.

Methods: Review of clinical studies evaluating feasibility, diagnostic performance and clinical applicability of REMS technology compared with standard densitometry in inflammatory diseases and pregnancy.

Results: Evidence suggests that REMS, a non-ionising ultrasound-based technique, allows axial skeletal assessment without radiation exposure and with fewer positioning constraints. Preliminary data indicate good agreement with DXA and improved feasibility in patients with spinal damage, disability or during pregnancy, where ionising techniques are restricted. REMS may therefore address important diagnostic gaps in challenging clinical scenarios. REMS especially attractive in clinical situations where ionising techniques are restricted or contraindicated, such as during pregnancy or in patients requiring repeated assessments. By improving accessibility and safety while maintaining diagnostic performance, REMS has the potential to address key diagnostic gaps and facilitate earlier, more inclusive bone health evaluation in complex and vulnerable patient populations.

Conclusion: Diagnostic limitations contribute significantly to the underrecognition of osteoporosis in inflammatory diseases and pregnancy. REMS technology represents a promising, patient-centred tool that may enhance accessibility, safety and accuracy of bone health assessment, although further validation and long-term outcome data are required.

Key words: bone assessment, clinical challenges, diagnostic gaps

NSS65 REMS APPLICATION IN INDIVIDUALS WITH INTELLECTUAL DISABILITY

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Background: Osteoporosis remains a critical health concern within populations with intellectual disabilities, particularly due to their increased susceptibility to fragility fractures, which negatively impact quality of life and elevate healthcare burdens. Traditional methods for bone mineral density (BMD) measurement, such as dual-energy X-ray absorptiometry (DXA), face significant limitations in access and applicability, especially in residential care settings. The emergence of radiofrequency echographic multi-spectrometry (REMS) presents an opportunity to provide effective BMD assessment without the constraints of transportation or cognitive barriers associated with DXA.

REMS has already shown significant utility in adult populations, particularly those with severe motor and intellectual disabilities (SMID) residing in long-term care facilities. A recent study involving 65 adults with SMID demonstrated that REMS successfully evaluated BMD in patients unable to undergo traditional assessments. The findings revealed low BMD across participants, with mean T-scores indicative of osteoporosis, underscoring the importance of REMS in identifying high fracture risk in this vulnerable demographic. This experience emphasizes REMS's potential in enhancing osteoporosis management among individuals with disabilities.

Methods: In our project, we focused on evaluating bone and muscle health in 50 children with cerebral palsy (CP). Building on previous insights from adult populations, we utilized REMS for BMD analysis for additional assessment, ensuring a comprehensive and safe evaluation process for this pediatric group. We measured critical parameters, including serum biomarkers of mineral metabolism, muscle sarcopenia markers such as Irisin, and indicators of neuronal damage and inflammation.

Results: Our findings revealed significant concerns regarding bone density and muscle function within the CP group, who exhibited a higher prevalence of low BMD and an increased risk of fragility fractures. Additionally, correlations between our data and physical activity metrics from wearable sensors highlighted disparities in energy expenditure and movement patterns commonly observed in children with CP.

Conclusion: Overall, this project underscores the effectiveness of REMS in assessing BMD in children with CP, illustrating its feasibility in addressing the unique challenges faced by this population. Our results emphasize the urgent need for targeted interventions to improve bone and muscle health, ultimately aiming to enhance the quality of life and minimize fracture risk in children with cerebral palsy.

NSS71 IMPROVING FRACTURE PREVENTION THROUGH ADVANCED DIAGNOSTIC TOOLS

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Objective: Fragility fractures are a major health concern in osteoporosis, often leading to morbidity, reduced quality of life and surgical interventions. Dual-energy X-ray absorptiometry (DXA), assesses bone mineral density (BMD), but fail to capture early microarchitectural deterioration and qualitative changes in bone, which limits their ability to identify patients at high fracture risk. This review aims to explore how advanced diagnostic tools can improve fracture risk prediction and contribute to early preventive strategies, potentially reducing the need for surgical interventions.

Material and Methods: A narrative review of 65 recent studies was conducted, focusing on three main areas: the limitations of conventional imaging modalities such as DXA in accurately predicting fracture risk, the clinical performance and potential advantages of emerging techniques including REMS in assessing both bone mineral density and bone quality, and strategies for early identification of patients at high risk for fragility fractures, including assessment of clinical risk factors.

Results: Evidence shows that fragility fractures frequently occur in patients with osteopenia as assessed by DXA, highlighting the need for more sensitive assessment of bone quality. REMS, a non-ionizing, portable and operator-independent technique evaluates both BMD and bone quality through fragility score with excellent precision (RMS-CV <0.5%), enabling detection of smaller changes over shorter intervals. Early identification of high-risk patients using REMS allows timely interventions, including pharmacologic therapy and fall prevention, which can reduce severe fracturesand potentially decrease the need for surgical management. While QCT also assesses trabecular bone and avoids superficial artifacts, it involves radiation, higher cost and limited portability, whereas REMS is radiation-free and suitable for bedside use.

Conclusion(s): Advanced diagnostic tools like REMS can overcome the limitations of conventional imaging by detecting early bone deterioration, supporting targeted preventive strategies and potentially reducing fracture incidence and surgical interventions in osteoporosis. Integration of such technologies into clinical practice may enhance fracture prevention and optimize patient care.

Key words: fracture prevention, improvement, diagnostic tools

NSS72 FRACTURE PREVENTION IN HIGH-RISK PATIENTS: THE CLINICAL ROLE OF REMS TECHNOLOGY

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Background: Patients with chronic kidney disease (CKD) commonly develop mineral and bone disorders (CKD-MBD), resulting in impaired bone quality and increased fracture risk. Standard diagnostic tools such as dualenergy X-ray absorptiometry (DXA) offer limited information on bone microarchitecture and can be confounded by aortic calcifications and degenerative changes, which are frequent in older and nephrology patients. Radiofrequency Echographic Multi-Spectrometry (REMS) is a radiation-free technique that assesses bone status through direct analysis of raw ultrasound signals and is gaining interest for bone fragility evaluation in nephrology settings.

Materials and Methods: Recent clinical evidence on REMS performance in osteoporosis and CKD/CKD-MBD-related bone disorders was reviewed. Comparative data versus DXA were considered, focusing on diagnostic accuracy, precision, and feasibility in complex patient groups. Practical case examples were used to illustrate how REMS may support individualized monitoring and treatment decision-making.

Results: Available data indicate that REMS may mitigate several limitations of DXA, particularly in the presence of vascular calcifications and degenerative spine disease. REMS-derived parameters show strong associations with fracture risk and may provide clinically relevant information in CKD patients, including individuals receiving dialysis.

Conclusion: REMS is a promising tool to improve bone fragility assessment not only in primary osteoporosis but also in nephrology populations that are challenging to evaluate with conventional imaging. Integrating REMS into multidisciplinary pathways (geriatrics, endocrinology, orthopedics, and nephrology) may support earlier identification, better risk stratification, and more personalized prevention strategies.

Keywords: CKD, Bone Fragility, REMS

NSS112 ULTRASOUND FOR FRACTURE PREDICTION

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Since the 1980's, Quantitative UltraSound (QUS) techniques have presented a significant interest for fragility fracture prediction, due to their non-ionizing nature, their sensitivity to structural and mechanical properties and their portability. Even though the initially introduced for clinical measurements, i.e., Broadband Ultrasonic Attenuation (BUA) and Speed of Sound (SOS) measured at the heel, and the velocity of the first arriving signal (VFAS), measured at the forearm or leg, showed strong evidence and performance comparable to the gold standard DXA, QUS was not yet widely accepted and recognized as standard-of-care in clinical guidelines, partly due to limited clinical evidence, but also because early QUS technologies have been considered to be poorly standardized, user-dependent, and difficult to interpret. This talk reviews the recognition of existing QUS technologies by well-acknowledged international clinical society, summarizes evidence of classical QUS technologies for fracture risk prediction and introduces the physical foundations of emerging techniques, i.e. pulse echo ultrasound (PEUS) [1], Radiofrequency Echographic Multi Spectrometry (REMS) [2], BiDirectional Axial Transmission with Guided Wave Dispersion Analysis (BDAT-GWDA) [3], and Cortical BackScattering (CortBS) [4]. While the two first techniques mainly propose DXA surrogates from ultrasound data measures at leg (PEUS), hip and spine (REMS), the two others (BDATGWDA, CortBS) are based on physical modelling and provide interpretable micro-and macrostructural bone properties, such as intracortical pore size distribution, pore density, porosity and cortical thickness. All these techniques have shown fracture discrimination performances comparable to DXA in clinical studies. Part of the future success of the implementation of these approaches will depend on the transparency of utilized algorithms, standardization, comparability between devices and the indisputable additional value to age and anthropometric data in the fracture risk evaluation, to be demonstrated in prospective clinical trials.

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P217 COMPARISON OF THE GERMAN DVO FRACTURE RISK THRESHOLDS AND REMSFRAGILITY SCORE IN THE ASSESSMENT OF THE INDIVIDUAL FRACTURE RISK

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Background: The determination of individual fracture risk and skeletal fragility is becoming increasingly relevant for a timely osteoporosis intervention and treatment. In recent years, different prediction models have been established to determine a probability associated to the risk of MOF or hip fractures including femoral BMD. Among these, the German DVO risk algorithm (developed by the Guideline Group of the German Umbrella Organization of Scientific Osteology Societies) is a step-by-step approach that classifies patients in groups of 3-years fracture risk incidence. The investigation aimed to compare the DVO fracture risk with the REMS-Fragility Score (FS), a dimensionless parameter (1-100) that provides information insight bone quality and skeletal fragility.

Material and Methods: In an observational study we recorded the data of patients who underwent DXA and REMS scans at an Orthopaedic Institute. The collection included DXA- and REMS-measurements at femur / lumbar spine, general patient information, medical and fracture history. Comparison between DVO and REMS-FS was analyzed using a Kruskal-Wallis test and Wilcoxon test.

Results: A total of n = 256 patients (128 per anatomical site) were analyzed. FS differed significantly across the DVO 2023 threshold groups (<3%, 3-5%, 5-10%, >10%) at both sites. Median FS increased stepwise with higher DVO thresholds from 14.58 (Q1–Q3: 12.68–21.12) in the < 3% group to 22.92 (19.53–29.94) 3-5% group, 33.38 (25.76–42.57) 5-10% group, and 55.50 (34.73–66.08) in the >10% group at femoral site. Lumbar spine, median FS increased from 24.08 (Q1–Q3: 21.60–28.07) in the < 3% group to 27.26 (23.87–33.38) 3-5% group, 29.98 (24.75–41.66) 5-10% group, and 40.65 (28.54–56.57) in the >10% group. Post-hoc comparisons showed significant differences (p< 0,05) between all group pairs.

Summary: The results show a good level of agreement between DVO risk algorithm 2023 and REMS-FS, thus further reinforcing the hypothesis that quantitative information of bone fragility plays a crucial role in skeletal fragility and fracture risk. These results also confirm the efficacy of FS in identifying high risk subjects. REMS ultrasound technology appears to be a valuable tool allowing a timely indication for intervention and preventive strategies.

P255 EFFECTIVENESS OF REMS TECHNOLOGY FOR SHORT-TERM MONITORING OF ROMOSOZUMAB EFFECT AT THE FEMORAL SITE IN POSTMENOPAUSAL WOMEN

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Objective(s): Romosozumab (RMZ) is a humanized monoclonal IgG2 antibody that selectively inhibits sclerostin, exerting a unique dual mechanism of action by stimulating bone formation and reducing bone resorption. This retrospective observational study aimed, for the first time, to evaluate the effectiveness of Radiofrequency Echographic Multi Spectrometry (REMS) for short-term monitoring of RMZ treatment in a cohort of post-menopausal women.

Materials and Methods: Post-menopausal women eligible for RMZ therapy were enrolled and monitored before (baseline) and at six-months (T1) follow-up. All the patients underwent REMS scans at the femoral site at both time-points to assess bone mineral density (BMD), T-score and Fragility Score (FS) values. Changes over time were analyzed using paired t-tests. Analyses were stratified by key variables (e.g., age group, BMI, prior osteoporosis therapy, number of vertebral fractures) to assess potential heterogeneity of treatment effects.

Results: A total of n = 27 patients (mean age: 71.7 ± 7.3 years) completed the six-months follow-up and were included in the analysis. At T1 a statistically significant increase in BMD was observed compared with baseline, with a 3.0% increase at the total hip (0.725 ± 0.103 g/cm² vs. 0.704 ± 0.108 g/cm²; p = 0.004) and a 2.7% increase at the femoral neck (0.573 ± 0.085 g/cm² vs. 0.558 ± 0.091 g/cm²; p = 0.006).

Conclusion(s): This retrospective observational study demonstrates, for the first time, the effectiveness of REMS technology in monitoring the short-term effects of RMZ in post-menopausal women, confirming the findings reported in the literature using standard densitometric technologies such as dual energy X-ray absorptiometry (DXA). Overall, thanks to its radiation-free nature, high-precision, high-portability and low-costs, REMS appears to be a valuable tool for assessing the real-world short-term clinical effectiveness of RMZ therapy.

P351 ARTIFICIAL INTELLIGENCE FOR OSTEOPOROSIS SCREENING AND FRACTURE RISK PREDICTION IN OLDER ADULTS: THE OSTEOFRACT-AI STUDY PROTOCOL

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Objective: To evaluate the clinical utility and diagnostic accuracy of an Artificial Intelligence (AI) tool for opportunistic osteoporosis screening using routine chest X-rays in hospitalized older adults. Secondarily, to develop and validate a multimodal predictive nomogram for 2-year fracture risk, integrating AI-derived bone health scores, inflammatory biomarkers (immunoporosis), and comprehensive geriatric assessment variables, while addressing potential gender disparities in fracture risk stratification.

Material and Methods: This is a prospective, observational, longitudinal study conducted at the Geriatric Department of the Hospital Universitario de Navarra (Spain). The study will recruit 1,002 hospitalized patients aged ≥75 years.

Intervention: Routine chest X-rays will be retrospectively analyzed using a Deep Learning software (Osteo Signal®) to generate a bone health score.

Comparators: AI scores will be compared against Radiofrequency Echographic Multi Spectrometry (REMS) densitometry, FRAX scores, and functional tests (PASE, 5-sit-to-stand).

Biomarkers: Pre-discharge blood samples will be analyzed for osteo-inflammatory markers (NLR, PLR, SII).

Follow-up: Participants will be followed for 24 months to record incident fragility fractures, mortality, and readmissions.

Statistics: Area Under the Receiver Operating Characteristic Curve (AUC-ROC) will assess diagnostic performance. Multivariate Cox regression will be used to construct the predictive nomogram (OSTEOFRACT-AI).

Results: We hypothesize that the AI algorithm will demonstrate high sensitivity for osteoporosis detection in this frailty-enriched cohort, comparable to REMS and superior to clinical risk factors alone. We anticipate identifying distinct "immunoporosis" profiles that correlate with higher fracture risk. The study aims to validate a cost-effective, opportunistic screening strategy that utilizes existing radiological resources to reduce the diagnosis gap, particularly in underdiagnosed older men. The final output will be a validated, sex-adjusted predictive tool for clinical use.

Conclusion: The OSTEOFRACT-AI project proposes a novel, scalable approach to fracture prevention in the oldest old by repurposing routine chest X-rays through AI. If validated, this strategy could democratize access to osteoporosis screening in resource-limited countries.

P499 TIMED UP AND GO TEST AND BONE MINERAL DENSITY MEASUREMENT WITH RADIOFREQUNCY ECHOGRAPHIC MULTISPECTROMETRY (REMS) IN OLDER FEMALES

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Objective: The Timed Up and Go (TUG) test assesses mobility and fall risk, while bone mineral density (BMD) measurement is essential for osteoporosis evaluation. Traditional BMD assessment with DXA involves radiation, whereas radiofrequency echographic multi-spectrometry (REMS) provides a non-invasive, radiation-free alternative. This study aimed to examine the relationship between TUG performance and BMD using REMS.

Material and Methods: 120 women completed the TUG test, rising from a chair, walking three meters, turning, returning and sitting down. Times were recorded and participants classified into four groups: <10 s, 11–20 s, 21–29 s, and ≥30 s. REMS scans of the spine and hip were performed, and age, BMI, BMD and T-scores were compared across TUG groups using ANOVA. Data collection utilized a JAVA tool developed by Kirilov et al [1,2].

Results: 71 women (59.2%) completed TUG <10 s, 25 (20.8%) 11–20 s, 15 (12.5%) 21–29 s, and 9 (7.5%) ≥30 s. Women with TUG ≥30 s were older (85 y) and had lower BMI (24.4 kg/m²) than other groups (p <0.001). Spine BMD and T-scores decreased with longer TUG times: ≥30 s group had mean BMD 0.628 g/cm², T-score -3.3 SD versus <10 s group 0.842 g/ cm², -1 SD (p <0.001). Hip BMD showed similar trends: ≥30 s group 0.445 g/cm², -3.6 SD versus <10 s 0.692 g/cm², -1.6 SD (p <0.001).

Conclusion: Slower TUG performance, particularly ≥30 s, is associated with lower spine and hip BMD and T-scores. Mobility assessment may help identify women at higher risk for osteoporosis and fractures, supporting early intervention.

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P580 EARLY DETECTION OF SKELETAL FRAGILITY IN BREAST CANCER PATIENTS WITH RADIOFREQUENCY ECHOGRAPHIC MULTI SPECTROMETRY (REMS)

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Objective(s): Patients with cancer are particularly prone to skeletal deterioration and fragility fractures as a result of the disease itself and/ or its treatment. Alterations in sex hormone levels, including testosterone and oestradiol which are key regulators of bone metabolism, play a central role in hormone-dependent cancers, such as breast cancer, contributing to bone loss and structural deterioration. This condition may be further exacerbated by aromatase inhibitors, including letrozole, which are generally associated to a significant decrease in bone mineral density (BMD).

Therefore, the present study aimed to evaluate the impact of letrozole therapy on fracture risk in breast cancer patients using Radiofrequency Echographic Multi-Spectrometry (REMS) technology.

Materials and Methods: Caucasian women with a diagnosis of breast cancer underwent REMS scans of lumbar spine (L1-L4). The technology integrates quantitative indicators of bone mass, namely BMD, T-score and Z-score, with a quantitative parameter of bone quality expressed by the Fragility Score (FS), to automatically classify patients into one of the seven risk classes (R1–R7), along with a corresponding probability to experience a short-term (within 5 years) major osteoporotic fracture.

Results: A total of 42 women were enrolled and included in the study with the following anthropometric characteristics: mean age = 63.78 ± 7.79 years and mean BMI = 27.94 ± 4.18 kg/m². The densitometric examinations showed reduced bone density (mean T-score -1.9 ± 0.8) and microarchitecture deterioration (mean FS = 55.34 ± 3.03). The fracture risk analysis classified patients in high-risk classes. Notably, 40% of patients treated with letrozole were classified in the highest risk classes (R5-R7).

Conclusion(s): Overall, the findings of this study highlight the significant skeletal fragility experienced by women affected by breast cancer. REMS has been shown to be a reliable, non-invasive technique for the early detection of fracture risk, providing a valuable alternative to conventional assessment methods. Therefore, REMS could be an important tool in managing osteoporosis in oncology patients, helping to reduce skeletal complications and preserve quality of life.

P581 INTEGRATED REMS AND MICRORNABASED EVALUATION OF MUSCULOSKELETAL IMPAIRMENT IN TYPE 2 DIABETES MELLITUS (T2DM)

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Objective(s): Type 2 diabetes mellitus (T2DM) is frequently associated with an increased risk of fragility fractures despite patients showing normal bone mineral density (BMD), a condition known as “diabetic bone paradox”. This phenomenon is driven by bone alterations related to chronic hyperglycaemia, advanced glycation end products (AGEs) and impaired collagen-cross linking and it is often accompanied by muscle conditions such as sarcopenia. The aim of this study was to explore the relationship between T2DM and locomotory system using Radiofrequency Echographic Multi Spectrometry (REMS) technology integrated to an in silico analysis of circulating microRNAs (miRNAs).

Materials and Methods: Individuals with (patient group) or without (healthy control group) T2DM condition were enrolled. Bone health status was evaluated by REMS-derived T-score and Fragility Score (FS) at both lumbar spine and femoral neck, whereas muscle health status was evaluated by REMS muscle quality index (MQI) at forearm and thigh. In parallel, an in silico analysis was performed using the HMDD v4.0, InteractiVenn, miRDB, WebGestalt and STRING databases to identify common miRNAs between T2DM, sarcopenia and osteoporosis, along with their target genes and hub proteins.

Results: The study included 48 subjects (24 per group), aged 60–80 years and with a BMI of 21–33 kg/m². MQI values were significantly higher in T2DM patients than in the control group at both thigh (84.13 ± 12.27 vs. 67.35 ± 17.60; $p < 0.0001$) and forearm (59.84 ± 9.71 vs. 36.22 ± 3.57; $p < 0.0001$). Bone assessment showed REMS-derived T-scores = −1.6 ± 0.64 and −1.6 ± 0.58, with reduced FS values (54.2 ± 14 and 49.3 ± 12) at lumbar spine and femoral neck, indicating increased skeletal fragility. Bioinformatic analysis identified 6 common miRNAs associated to T2DM, sarcopenia, and osteoporosis, targeting genes mainly involved in collagen organisation, bone remodelling, and muscle metabolism.

Conclusion(s): Patients with T2DM show concomitant impairment of bone quality and muscle status that cannot be fully captured by BMD alone. Integrating REMS-derived musculoskeletal assessment with miRNA bioinformatic analysis is a promising, non-invasive strategy for early detection of T2DM-related musculoskeletal deterioration and improved fracture risk stratification.

P582 REMS-BASED EVALUATION OF FRACTURE RISK IN KIDNEY TRANSPLANT RECIPIENTS

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Objective(s): Kidney transplantation is an invasive procedure often associated with long-term musculoskeletal complications, including reduced bone mineral density (BMD) and altered trabecular microarchitecture, resulting in an increased fracture risk. Immunosuppressive therapy and disruption of the parathyroid hormonevitamin D–FGF23 axis further contribute to bone damage. This study aimed to evaluate short-term fracture risk in kidney transplant recipients using Radiofrequency Echographic Multi Spectrometry (REMS).

Materials and Methods: Inclusion criteria were as follows: men and women who had previously undergone a kidney transplant. All participants underwent REMS evaluation of the lumbar spine (L1–L4). This ultrasound-based technique analyses native radiofrequency signals by comparing them with a reference database, allowing the assessment of bone quantity (BMD, T-score, Z-score) and bone quality through the Fragility Score (FS), an index that indicating microarchitectural deterioration and skeletal fragility. By integrating REMS T-score and REMS FS, patients were automatically classified into one of the seven risk classes (R1–R7) along with a probability to experience a short-term(within 5 years) major osteoporotic fracture.

Results: At the end of the enrolment, n = 50 individuals were included in the analysis (mean age = 55–85 years and mean BMI = 18–26 kg/m²). The analysis of the short-term fracture risk revealed that all the participants were categorised into high-risk classes, and predominantly within R5 and R6. The corresponding estimated five-year probability of major osteoporotic fractures was found to range from 3.5% to 6% in R5, increasing to 6% - 10% in R6.

Conclusion(s): These findings demonstrate that kidney transplant recipients are at substantial risk of fragility fractures, emphasising the importance of regular bone health monitoring. REMS is a valuable noninvasive approach for evaluating bone density and microarchitecture. These findings support the implementation of early, individualised preventive strategies to reduce fracture occurrence and improve longterm patient management.

P630 REMS-BASED EVALUATION OF SKELETAL FRAGILITY IN PATIENTS WITH TYPE 2 DIABETES MELLITUS (T2DM)

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Objective(s): Type 2 diabetes mellitus (T2DM) has emerged as a relevant risk factor for skeletal fragility despite exhibiting normal or even increased bone mineral density (BMD) when assessed by standard densitometric technologies such as dual-energy X-ray absorptiometry (DXA). This phenomenon is known as the "diabetic bone paradox," suggests an impairment of bone quality. In this context, this study aimed to evaluate BMD in patients with T2DM using Radiofrequency Echographic Multi Spectrometry (REMS) in comparison with DXA. In addition, bone quality was explored through the REMS Fragility Score (FS).

Materials and Methods: Inclusion criteria were: Caucasian individuals, both genders, with a diagnosis of T2DM that underwent both DXA and REMS scans at the same axial reference sites (lumbar spine and femur). Bone quantity was assessed by DXA- and REMS-BMD, whereas bone quality was evaluated using REMS-FS, a non-dimensional parameter ranging from 0 to 100, where higher values indicate a higher compromised microarchitectural framework. Comparisons between DXA- and REMSBMD were analysed using paired t-test.

Results: A total of n = 99 patients (mean age = 73.1 ± 7.9 years) were included in the analysis. REMS-BMD values were significantly lower than DXA-BMD at the total hip (0.776 ± 0.116 vs. 0.834 ± 0.146 g/cm²) and femoral neck (0.630 ± 0.110 vs. 0.717 ± 0.133 g/cm²; $p < 0.0001$ for both). The mean REMS-FS was 45.4 ± 9.4, indicating compromised bone microarchitecture. Similar findings were observed at the lumbar spine.

Conclusion(s): This study demonstrated significant differences between REMS and DXA in the assessment of BMD in patients with T2DM, with REMS-BMD showing lower values, and thus revealing a higher prevalence of osteopenic/osteoporotic condition, as expected. Furthermore, the inclusion of bone quality analysis through REMS-FS enables the evaluation of skeletal microarchitectural and fragility, providing additional insights into the effects of T2DM on bone health. Overall, these findings support the potential role of REMS as a valuable tool to improve osteoporosis diagnosis and fracture risk assessment in patients with T2DM.

P631 PREVIOUS FRACTURES AS A DETERMINANT OF FRAGILITY RISK IN SYSTEMIC SCLEROSIS

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Objective(s): Patients affected by systemic sclerosis, a rare connective tissue disease characterized by progressive fibrosis of the skin and other internal organs, are at increased risk of osteoporosis due to chronic inflammation, reduced mobility and glucocorticoid therapy. In addition, comorbidities, including rheumatoid arthritis, thyroid disorders, hypercholesterolemia and previous fragility fractures, may further exacerbated the risk. This study aimed to assess skeletal fragility in patients with systemic sclerosis using Radiofrequency Ecographic Multi Spectrometry (REMS) technology, with a focus on the impact of previous fractures.

Materials and Methods: REMS femoral scans were performed on Caucasian men and women diagnosed with systemic sclerosis. REMS provides information on both bone quantity (BMD, T-score and Z-score) and bone quality (through the Fragility Score, FS). By combining T-score and FS, REMS also classify patients into 7 risk classes (named from R1R7), each with a progressive probability to develop a short-term (within five-years) hip fracture.

Results: The study included 85 patients (mean age 65.13 ± 11.57 years; mean BMI 25.89 ± 3.75 kg/m²). REMS assessment revealed an average T-score of −2.2 ± 0.8 and an average FS of 66.43 ± 20.45, thus indicating a deterioration of both bone quantity and quality parameters. The fracture risk stratification showed that the 81% of the patients was classified in the high-risk categories (R5–R7). Specifically, individuals with a history of previous fractures were more frequently represented in the high-risk classes: the 30.8% of these patients, for example, was classified in R7.

Conclusion(s): Patients with systemic sclerosis exhibit a markedly elevated susceptibility to fragility with more than 80% classified in the high-risk classes. Moreover, a history of previous fractures was found to further exacerbate the risk, suggesting an additive effect of multiple predisposing factors. These findings highlight the importance of early bone assessment in this high-risk population. In this context, REMS technology emerges as a valuable, non-invasive tool for identifying individuals at increased fracture risk and supporting targeted prevention strategies.

P632 MUSCULOSKELETAL ASSESSMENT BY RADIOFREQUENCY ECHOGRAPHIC MULTI SPECTROMETRY (REMS) IN WOMEN WITH OVARIAN CANCER

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Objectives: Dual x-ray absorptiometry (DXA) is the gold standard for bone mineral density (BMD) assessment in chronic kidney disease patients, but it can have limited accuracy and radiofrequency echographic multispectrometry (REMS) may overcome some of its limitations. We aimed to evaluate and compare longitudinal BMD changes assessed by DXA and REMS in peritoneal dialysis (PD) patients.

Material and Methods: Prospective cohort study including 20 PD patients that underwent two separate DXA and REMS evaluations. Clinical, biochemical, and imaging data, including abdominal aorta calcification (AAC) scores and fracture history were collected. Longitudinal BMD changes were analyzed using linear mixed-effects models.

Results: Over a median follow-up period of 19.8 months, DXA revealed significant BMD declines at the femoral neck (FN) (−3.2%, p=0.039) while REMS showed non-significant numerical declines (figure 1). REMS consistently yielded lower BMD values than DXA at both lumbar spine (LS) and FN. Despite these differences, the trajectories over time were similar between DXA and REMS for LS BMD (p=0.806) and FN BMD (p=0.229, table 1), regardless of whether patients were receiving antiosteoporosis treatment and of the presence of fractures. However, there was no correlation of the annualized changes in BMD at the FN and LS between the two methods (r^2=0.001, p=0.905 and r^2=0.001, p=0.928, respectively).

Conclusion: REMS and DXA demonstrated similar longitudinal trends in BMD, but DXA detected a significant decline in BMD at cortical sites, whereas REMS did not. Larger studies are needed to clarify the comparative and complementary roles of REMS and DXA in monitoring bone health in end-stage kidney disease.

P706 NON-INVASIVE PREVENTION OF FRAGILITY FRACTURES: THE ROLE OF REMS IN THE SVOLTA PROJECT

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Objective(s): Osteoporotic fractures significantly impair quality of life and increase the risk of subsequent fractures. Continuous monitoring of patients with prior fragility fractures is essential for secondary prevention and fracture risk stratification. This study proposes an integrated followup model based on Radiofrequency Echographic Multi-Spectrometry (REMS) to assess fracture risk, monitor bone quality and prevent refractures in frail patients.

Materials and Methods: Clinical data were collected from a multicentre study involving Policlinico University Hospital in Bari, Tor Vergata University Hospital in Rome and Giuliano Isontina University Hospital in Trieste. Caucasian patients of both genders, aged between 50 and 75, with a history of primary fragility fractures, were enrolled in the study. All patients underwent a REMS scan of the spine, and the scan parameters (T-score, fragility score and fracture risk classification) were recorded to enable targeted monitoring.

The following work is part of the SVOLTA Project (Sviluppo di un Servizio per la preVenzione e riduziOne delLe fratTure da frAgilità) carried out with the technical and financial support of the Ministry of Health - CCM.

Results: A total of 38 patients (35 women and 3 men) were included. Wrist fractures were the most prevalent (45%), followed by vertebral (21%) and humeral fractures (13%). The analysed patient group showed reduced bone density values (mean T-score = -1.9 ± 0.9) and poor bone microarchitecture quality (mean fragility score = 38.18 ± 8.03). In particular, the 82% was classified into medium-high risk classes (R4R7), each associated to a probability of imminent (within 5 years) risk of major fragility fractures. Each of them has been assigned to a specific therapy and monitoring programme on the base of their identified risk class, thus improving patient assignment and personalised management

Conclusion(s): In conclusion, the presented model suggests that using REMS technology to follow up with patients who have previously experienced fragility fractures would improve secondary prevention, optimise continuity of care, reduce fragility fractures and lower costs for the National Health Service.

P1030 LONGITUDINAL EVALUATION OF BONE STATUS WITH RADIOFREQUENCY ECHOGRAPHIC MULTI SPECTROMETRY (REMS) TECHNOLOGY IN A PERITONEAL DIALYSIS COHORT

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Objectives: Dual x-ray absorptiometry (DXA) is the gold standard for bone mineral density (BMD) assessment in chronic kidney disease patients, but it can have limited accuracy and radiofrequency echographic multispectrometry (REMS) may overcome some of its limitations. We aimed to evaluate and compare longitudinal BMD changes assessed by DXA and REMS in peritoneal dialysis (PD) patients.

Material and Methods: Prospective cohort study including 20 PD patients that underwent two separate DXA and REMS evaluations. Clinical, biochemical, and imaging data, including abdominal aorta calcification (AAC) scores and fracture history were collected. Longitudinal BMD changes were analyzed using linear mixed-effects models.

Results: Over a median follow-up period of 19.8 months, DXA revealed significant BMD declines at the femoral neck (FN) (−3.2%, p=0.039) while REMS showed non-significant numerical declines (figure 1). REMS consistently yielded lower BMD values than DXA at both lumbar spine (LS) and FN. Despite these differences, the trajectories over time were similar between DXA and REMS for LS BMD (p=0.806) and FN BMD (p=0.229, table 1), regardless of whether patients were receiving antiosteoporosis treatment and of the presence of fractures. However, there was no correlation of the annualized changes in BMD at the FN and LS between the two methods (r^2=0.001, p=0.905 and r^2=0.001, p=0.928, respectively).

Conclusion: REMS and DXA demonstrated similar longitudinal trends in BMD, but DXA detected a significant decline in BMD at cortical sites, whereas REMS did not. Larger studies are needed to clarify the comparative and complementary roles of REMS and DXA in monitoring bone health in end-stage kidney disease.

	Lumbar Spine		Femoral Neck	
Change in BMD over time (x time)				
Unadjusted Analysis				
	Coefficient	**p-value**	**Coefficient**	**p-value**
REMS (compared to DXA)	0.074	0.806	-0.002	0.229
Adjusted Analysis				
	Coefficient	**p-value**	**Coefficient**	**p-value**
AAC score	0.002	0.957	0.002	0.177
Treatment (yes)	-0.002	0.754	-0.001	0.672
Vertebral fractures (yes)	-0.007	0.136	-0.017	0.872
REMS (compared to DXA) x AAC score	-0.011	0.465	-0.003	0.210
REMS (compared to DXA) x Treatment	-0.003	0.754	0.005	0.911
REMS (compared to DXA) x Fractures	0.004	0.525	0.007	0.710

Footnote: BMD - bone mineral density; DXA - dual x-ray absorptiometry; REMS - Radiofrequency Echographic Multi-Spectrometry; AAC abdominal aorta calcification

Figure 1 – Individual longitudinal evaluation of BMD and T-scores assessed by DXA and REMS (A – BMD LS, B – T-Score LS, C – BMD FN, D – T-Score FN). p-values derived from linear mixed-effects with covariate (time between evaluations).

P1032 RADIOFREQUENCY ECHOGRAPHIC MULTI SPECTROMETRY (REMS) TECHNOLOGY IN THE EVALUATION OF GLUCOCORTICOIDINDUCED OSTEOPOROSIS IN SYSTEMIC LUPUS ERYTHEMATOUS PATIENTS

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Objectives: The aim of this study was to assess the diagnostic agreement between Radiofrequency Echographic Multi Spectrometry (REMS) and dual-energy X-ray absorptiometry (DXA) for bone mineral density (BMD) in patients with systemic lupus erythematosus (SLE), particularly those receiving glucocorticoids (GCs).

Material and Methods: 106 SLE patients (44 GC-treated) underwent BMD assessment using both DXA and REMS. We compared BMD and T-scores between methods and analyzed diagnostic agreement using linear regression, Cohen's kappa and Bland-Altman analysis. Receiver operator characteristic (ROC) curves evaluated the ability of REMS and DXA to discriminate fracture status. To assess the predictive performance of both methods relative to patient demographic characteristics, we used FRAX to estimate the 10-year major osteoporotic fracture risk based solely on age, sex, and body mass index (BMI) for each patient.

Results: BMD measurements at all sites were significantly lower with REMS when compared with DXA across all skeletal sites ($p<0.001$). Agreement in osteoporosis classification was slight to moderate (κ ranging from 0.229 at lumbar spine (LS) in all patients to 0.549 at femoral neck (FN) in GC-treated patients, table 1). REMS showed moderate correlation with DXA and demonstrated 45% sensitivity and 88.4% specificity for diagnosing osteoporosis. ROC curves in all patients demonstrated that REMS exhibited similar discriminative ability compared to DXA across all skeletal sites evaluated (Fig.1). When a clinical predictor model based on age, sex, and BMI was included, its standalone AUC was 0.735 (95% CI 0.582-0.889) at the FN and 0.729 (95% CI 0.574-0.884) at the LS, comparable to REMS and DXA. In a linear regression model, REMS BMD values were more strongly associated with age, sex, and body mass index: r^2 values for REMS LS (r^2=0.569), FN (r^2=0.696), and total hip (r^2=0.744), compared to the corresponding r^2 values for DXA (0.208, 0.489, and 0.429, respectively).

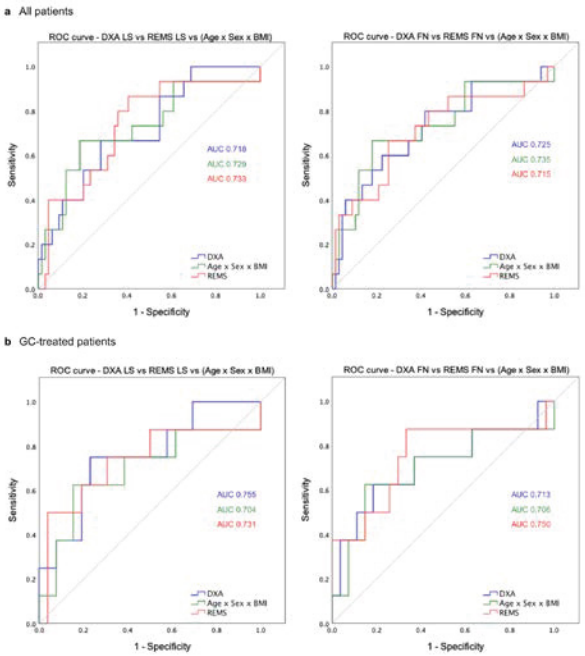
Conclusion: REMS and DXA showed a fair to moderate agreement in osteoporosis diagnosis and in fracture discrimination in SLE patients. REMS measurements showed stronger associations with age, sex, and BMI than DXA.

Table 1 - Association and agreement between radiofrequency echographic multispectrometry (REMS) and dual x-ray absorptiometry (DXA) in the overall SLE population and glucocorticoid (GC) treated group; * represents $p<0.05$

	GC treated (n=44)			All patients (n=106)		
Anatomical site	**Lumbar Spine**	**Femoral Neck**	**Total Hip**	**Lumbar Spine**	**Femoral Neck**	**Total Hip**
Valid cases (n)	34	35	34	79	82	78
Sensitivity° (%)	33.3	60.0	0.0	33.3	45.5	40.0
Specificity° (%)	91.4	94.9	94.6	90.4	89.5	96.6
κ	0.239	0.549*	-0.036	0.229	0.301*	0.366
r	0.40*	0.41*	0.50*	0.54*	0.50*	0.61*
r^2	0.16*	0.17*	0.25*	0.29*	0.25*	0.37*
Regression line slope	0.40	0.39	0.44	0.42	0.34	0.65
SEE (g/cm²)	0.190	0.127	0.132	0.157	0.118	0.109
Average differences (mean±1.96 SD, g/cm²)	0.171±0.211	-0.128±0.165	-0.066±0.152	-0.197±0.192	-0.146±0.136	-0.078±0.165
	All sites			**All sites**		
Diagnostic Classification, n (%)	Normal	Osteopenia	Osteoporosis	Normal	Osteopenia	Osteoporosis
REMS	18 (40.9)	20 (45.5)	6 (13.6)	39 (36.8)	48 (45.3)	19 (17.9)
DXA	14 (31.8)	16 (36.3)	12 (27.3)	36 (34.0)	50 (47.2)	20 (18.9)

°for classification of osteoporosis REMS vs DXA T-scores

Fig.1 Receiver operator characteristic (ROC) curves comparing the diagnostic performance of dual x-ray absorptiometry (DXA) and radiofrequency echographic multispectrometry (REMS) and the clinical predictor model (age x sex x body mass index) in identifying morphometric vertebral fractures in all patients (a) and in glucocorticoid (GC) treated patients (b)



P1101 BONE HEALTH ASSESSMENT IN PATIENTS WITH PROSTATE CANCER: ROLE OF REMS TECHNOLOGY

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Objective: Prostate cancer (PCa) and its treatments, particularly androgen deprivation therapy (ADT), accelerate bone loss and increase fracture risk. Early detection of skeletal fragility is crucial. This study evaluates femoral neck bone mineral density (BMD) using Radiofrequency Echographic Multi-Spectrometry (REMS), a non-ionizing, ultrasoundbased technique validated for osteoporosis diagnosis and fracture risk prediction (1-6).

Material and Methods: Fifty-one Caucasian men with PCa and an age-, BMI-, and ethnicitymatched healthy control group underwent REMS scans of the femoral neck to obtain BMD, T- and Z-scores. Statistical differences were evaluated using t-tests. Literature-based evidence was integrated to contextualize REMS findings regarding ADT exposure, fracture risk, and comparison with DXA outcomes.

Results: Groups were comparable for age (73.5 ± 7.3 vs. 73.4 ± 7.2 years) and BMI (25.3 ± 2.9 vs. 25.3 ± 3.1 kg/m²). PCa patients showed significantly lower femoral neck BMD, T- and Z-scores than controls (BMD reduction: -3.4%, $p < 0.05$). REMS identified early bone deterioration not always detected by DXA, demonstrating high reproducibility and precision. These results corroborate ADT-induced skeletal fragility and suggest REMS as a sensitive tool for fracture risk prediction (7-8) (Table 1).

Conclusion: REMS enables early detection of bone loss in PCa patients, supporting personalized preventive strategies and monitoring, particularly for those receiving ADT (Fig. 1). Its non-ionizing nature, bedside applicability, and validated predictive accuracy make REMS a valuable addition to routine skeletal assessment, potentially improving long-term outcomes and reducing fracture incidence (9-10).

Limitations: The study is limited by sample size and single-center design, which may affect generalizability. REMS is operator-dependent, and while reproducibility is high, standardization of scanning technique is crucial. Longitudinal fracture outcome data were not available, and future multicenter, prospective studies are needed to confirm predictive value and cost-effectiveness compared with DXA in PCa populations.

Group	Measurement site	BMI	BMD (g/cm²)	T-score	Z-score
Prostate Cancer	Lumbar Spine	25.6 ± 2.9	0.885 ± 0.08	-1.9 ± 0.8	-0.7 ± 0.7
	Femoral Neck	25.3 ± 2.9	0.691 ± 0.08	-1.8 ± 0.7	-0.7 ± 0.6
Healthy Control	Lumbar Spine	25.7 ± 2.7	0.945 ± 0.11	-1.3 ± 1.0	-0.2 ± 0.9
	Femoral Neck	25.3 ± 3.1	0.715 ± 0.1	-1.5 ± 0.7	-0.2 ± 0.9

Table 1.Comparison of BMI, Bone Mineral Density (BMD), T-score, and Z-score between Prostate Cancer Group and Healthy Control Group: there is the summarize the BMI, BMD, T-score, and Z-score measurements at the lumbar spine and femoral neck in two groups: PCa patients undergoing ADT and healthy controls. The PCa group shows significantly lower BMD values at both measurement sites compared to the healthy control group, with a more pronounced decrease observed in the femoral neck. Additionally, the T-scores for both the lumbar spine and femoral neck in the PCa group indicate lower bone mineral density compared to the average young adult population, reflecting the osteoporotic effects of ADT. Z-scores show that the PCa group has reduced bone density relative to age-matched controls. These differences highlight the impact of ADT on bone health in PCa patients.

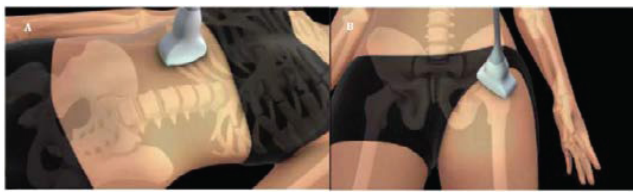

Figure 1 .Acquisition method: REMS technology assesses bone health using a simple ultrasound scan of the spine and femur. The probe is placed on the abdomen to scan the lumbar vertebrae (L1-L4) (A) or on the hip to scan the femoral neck (B). The scans are performed using a dedicated device (EchoStation, Echolight Spa, Lecce, Italy) with a 3.5 MHz convex transducer. For the lumbar spine, the probe is placed in a trans-abdominal position, with each vertebra scan taking 20 seconds, totaling 80 seconds for the entire L1-L4 region. For the femur, the probe is aligned with the femoral head, neck, and trochanter, and the scan lasts 40 seconds.
After scanning, the data is processed automatically to analyze the bone structure and compare it to reference models based on gender, age, site, and BMI, providing a patient-specific bone health profile (Figures used came from the article: Gifuni R, Montatore M, Et al. Radiofrequency Echographic Multi-Spectrometry in the Diagnosis of Metabolic Bone Disease. Semin Musculoskelet Radiol. 2024 Oct;28(5):547-556. doi: 10.1055/s-0044-1788885).

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P1298 A SIMULTANEOUS EVALUATION OF MUSCLE AND BONE HEALTH IN PATIENTS WITH OBESITY USING REMS TECHNOLOGY

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Objective(s): Muscle and bone are closely interconnected tissues that ensure structural integrity, mobility and functional capacity. Alterations in this interplay contribute to musculoskeletal disorders, such as osteoporosis and sarcopenia, which often coexist, increasing frailty and fracture risk. In patients affected by obesity, bone mineral density (BMD) may appear preserved or increased, while bone quality is often compromised, contributing to increased fracture risk. Early assessment of musculoskeletal health is therefore crucial. This study aimed to evaluate bone and muscle health in patients with obesity using Radiofrequency Echographic Multi-Spectrometry (REMS), a non-invasive, radiation-free technology.

Materials and Methods: Caucasian individuals of both sexes, with a diagnosis of obesity (BMI ≥30 kg/m²) were enrolled and underwent REMS evaluation to assess both bone and muscle. Bone status at femoral site was assessed by the evaluation of bone density (BMD, T-score and Z-score) and quality (Fragility Score (FS), a dimension-less parameter ranging from 0 to 100 reflecting microarchitecture and skeletal fragility) parameters. Muscle status was evaluated at thigh through the REMSMuscle Quality Index (MQI), which increases with muscle impairment.

Results: A total of n = 38 patients with obesity was included (mean age = 50.6 ± 13.4 years, BMI 33.19 ± 6.89 kg/m²). Patients with obesity showed higher BMD at femoral neck in comparison to controls (0.890 ± 0.120 g/cm2 vs. 0.850 ± 0.100 g/cm2 ; $p < 0.05$). Although not statistically significant, a trend toward increased FS values was observed, suggesting worse bone quality in the obese group (31.84 ± 11.22 vs. 29.30 ± 10.66; $p = 0.3$). Interestingly, patients with obesity also showed higher MQI value at both the right (67.29 ± 14.13) and left thigh (65.5 ± 15.79), strongly suggesting impaired muscle quality.

Conclusion(s): These preliminary results suggest that REMS enables simultaneous assessment of bone and muscle using a single device, providing an integrated evaluation of musculoskeletal health. The presence of impaired muscle quality together with a trend toward reduced bone quality supports the concept of a coupled muscle-bone unit, with clinical relevance for early diagnosis and management.

P1376 PREVALENCE AND DETERMINANTS OF OSTEOPOROSIS IN PATIENTS WITH RHEUMATOID ARTHRITIS USING EMERGING REMS TECHNOLOGY - EVIDENCE FROM A REAL-WORLD COHORT

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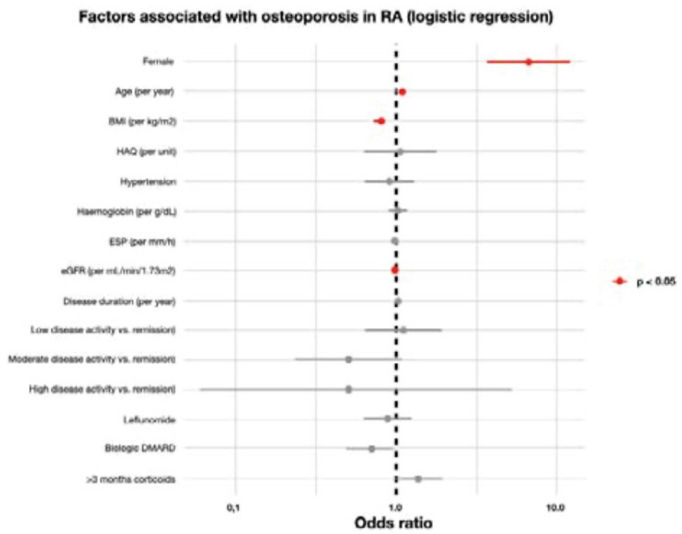
Background/Objective: Rheumatoid arthritis (RA) is a chronic autoimmune disease characterised by persistent inflammation and progressive joint damage. Osteoporosis (OP) is one of its most consequential systemic complications. Individuals with RA have nearly twice the risk of OP compared with the general population due to the combined effects of inflammation, sarcopenia, reduced mobility and glucocorticoid exposure. Radiofrequency Echographic Multi-Spectrometry (REMS) has emerged as a valuable alternative, demonstrating diagnostic equivalence to DXA and greater accuracy. Some guidelines now endorse REMS when DXA is unavailable or unreliable. The aim of the study was to estimate the prevalence of OP and identify associated factors in a real-world RA cohort assessed with REMS.

Methods: A retrospective cross-sectional study included 1,290 adults with RA from a rheumatology centre. Only patients with a last year REMS of lumbar spine and/or femoral neck assessment were analysed. Sociodemographic data, comorbidities, disease activity, laboratory parameters and treatments were extracted from electronic records. OP was defined as a T-score ≤ −2.5. Bivariate analyses compared OP vs non-OP groups; multivariable logistic regression identified independent predictors.

Results: OP was present in 985 individuals (76%). Patients with OP were older (73 ± 8 vs 67 ± 6 years; $p < 0.001$), had lower BMI, lower haemoglobin and markedly reduced eGFR (63 vs 84 mL/min/1.73 m²; $p < 0.001$). Comorbid hypertension and cardiovascular disease were more frequent in the OP group. Disease activity did not differ between groups. Biologic DMARDs were more common in non-OP patients (30% vs 23%; $p = 0.016$). In adjusted models, female sex (OR 6.79; 95% CI 3.74–12.4), age (OR 1.10 per year; 95% CI 1.07–1.13), lower BMI (OR 0.80; 95% CI 0.76–0.84) and reduced eGFR (OR 0.99; 95% CI 0.98–1.00) were independently associated with OP. Biologic therapy showed a non-significant protective trend; glucocorticoid exposure was not independently associated.



OR: odds ratio; CI: confidence interval; BMI: body mass index; CVD: cardiovascular disease; Hb: haemoglobin; eGFR: estimated glomerular filtration rate; HAQ: Health Assessment Questionnaire; yrs: years.

Figure 1. Multivariable logistic regression of demographic, clinical, and therapeutic factors in rheumatoid arthritis patients on associated osteoporosis factors

Conclusions: OP was very common in this large Latin American RA cohort. Classic risk factors, older age, female sex and low BMI, were strongly associated with OP. Biologic therapy may offer protection, though further study is needed. REMS proved feasible and clinically informative in a population with limited DXA access.

P1376 PREVALENCE AND DETERMINANTS OF OSTEOPOROSIS IN PATIENTS WITH SYSTEMIC LUPUS ERYTHEMATOSUS USING EMERGING REMS TECHNOLOGY - EVIDENCE FROM A REAL-WORLD COHORT

P. Santos-Moreno [1] , J. Arias-Aponte [1] , A. Riobó-Santamaría [1] , J. Villamarin-Rojas [1] , F. Rodríguez-Florido [1] , P. RodríguezLinares [1] , L. Villarreal [1] , N. Gutiérrez-Gaitán [1] , A. RojasVillarraga [2]

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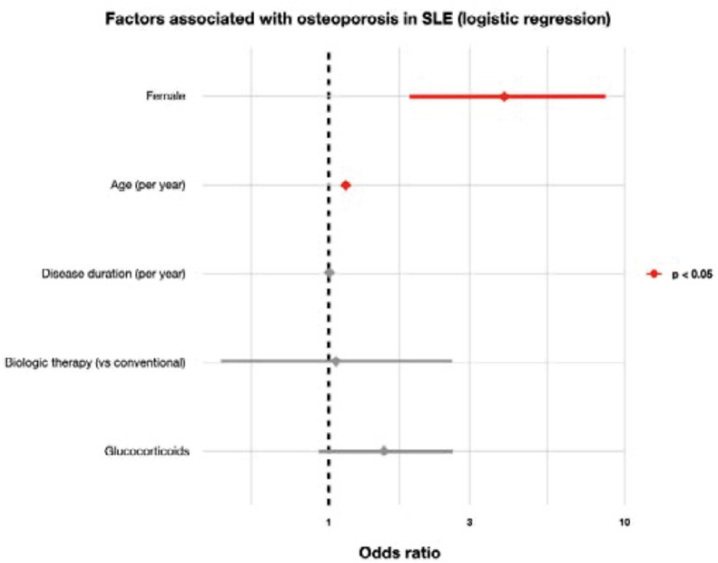
Background/Objective: Osteoporosis (OP) is a common comorbidity in systemic lupus erythematosus (SLE), driven by chronic inflammation, prolonged glucocorticoid exposure, hormonal influences, and reduced physical activity. In Latin America, evidence about OP is scarce and assessment often limited by restricted access to DXA the gold-standard examination. Radiofrequency Echographic Multi-Spectrometry (REMS), a portable and radiation-free ultrasound-based technology, offers an alternative, and its clinical relevance has been highlighted by ESCEO. The aim of the study was to estimate the prevalence of OP and identify associated factors in Colombian SLE patients assessed with REMS in routine practice.

Methods: A retrospective cross-sectional study of 385 adults with SLE from a rheumatology referral center. Lumbar spine and/or femoral neck Bone Mineral Density (BMD) was measured using REMS (ECHOLIGHT®). OP was defined using age-specific thresholds: T-score ≤ −2.5 in individuals ≥50 years, and Z-score ≤ −2.0 in those <50 years. Group comparisons used t-tests and Chi-square/Fisher tests; multivariable logistic regression identified independent predictors.

Results: OP prevalence was 55.6 %. Patients with OP were more often female (92 % vs 81 %; p = 0.002), had slightly longer disease duration (17 ± 10 vs 15 ± 10 years; p = 0.019) and more frequent glucocorticoid use (71 % vs 60 %; p = 0.025). Age and SLEDAI activity scores were similar between groups. Lumbar spine T-scores were consistently lower than femoral neck values. In adjusted analyses, age (OR 1.15; 95 % CI 1.111.18) and female sex (OR 4.00; 95 % CI 1.91–8.85) remained independent predictors; glucocorticoids showed a non-significant trend (OR 1.54; p = 0.10) (Figure 1). The age-specific T/Z-score approach identified a clinically relevant subgroup of younger, steroid-exposed patients with low Z-scores.



Multivariable logistic regression of demographic, clinical, and therapeutic factors in Lupus patients on associated Osteoporosis factors

Conclusions: OP was highly prevalent in this Colombian SLE cohort assessed with REMS. Age and female sex were the main determinants, while age-specific densitometric thresholds enabled the detection of younger, glucocorticoid-exposed patients who may be overlooked. REMS proved feasible and clinically valuable in a setting with limited DXA availability, supporting its role in improving OP detection and guiding targeted bone-health surveillance in SLE.

P1592 RADIOFREQUENCY ECHOGRAPHIC MULTISPECTROMETRY (REMS) IN OBESE TYPE 2 DIABETIC PATIENTS

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Objective: To evaluate the effectiveness of Radiofrequency Echographic MultiSpectrometry (REMS) comparing with Dual-energy X-ray Absorptiometry (DEX) in type 2 diabetic patients with overweight or obesity.

Material and Methods: 13 men and 22 women with type 2 diabetes mellitus (DM2) with body mass index (BMI) ≥25 kg/m2 were included in the study. Patients having osteoporosis, low-density fractures or those receiving specific therapy for osteoporosis were not included. All the patients underwent both DEX and REMS. Bone mineral density in vertebrae and femur neck, diabetic history, glucose-lowering therapy were analyzed. Thereafter 20 patients were administered GLP-1RA for body weight reduction. Baseline all patients both underwent REMS and DEXA. Subsequently, REMS in them after 6 months was conducted to compare the REMS bone density parameters, effectiveness of vertebrae visualization and the scanning depth required.

Results: Among 35 diabetic patients aged 60 [55; 67] years 7 patients (20%) were overweight (BMI 26.5 [25.7; 28.5], 17 (48.5%) had obesity 1 class (BMI 32.0 [31.4; 33.5]), 9 (25.7%) had obesity 2 class (BMI 36.4 [36.0; 38.5]) and 2 patients (5.7%) had obesity 3 class (BMI 42.9 [41.5; 43.3] kg/m2). All the patients received metformin, while 57% were also treated with GLP-1RA, 31% with SGLT2i, 6% with DPP4i and 20% with insulin. According to DEX, 30 patients had normal T-score in L1-L4, 3 had osteopenia, 2 had osteoporosis. According to REMS, 23 patients had normal T-score, 10 had osteopenia, 2 had osteoporosis, discordant values of DEX and REMS were observed in 13 cases (37%). DEX revealed normal values in femur neck among 22 patients, osteopenia in 12 patients and one case of osteoporosis. At the same time, REMS showed normal values in 27 patients, osteopenia in 8 cases and no cases of osteoporosis, discordant data were obtained in 11 cases (31%). We did not notice any correlation of discordant data with obesity class or glucose-lowering therapy. The loss of 7.0 [5.0; 11.0] kg (6.5 [5.5; 7.5] % from baseline) during 6 months of GLP-1RA therapy was associated with improved vertebral visualization (4 vs 3 vertebrae at baseline), though scanning depth or T-score did not significantly change.

Conclusion(s): REMS can be used as an adjunct to DXA in obese patients with T2DM, but its potential as a standalone diagnostic method requires further investigation. Moderate weight loss does not significantly affect REMS results.

P1621 ADVANCING BONE HEALTH IN PREGNANCY: EVIDENCE FROM THE POI PROJECT USING REMS TECHNOLOGY

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Objective(s): Pregnancy-related osteoporosis is characterised by increased bone loss and higher risk of fragility fractures, especially during the third trimester and the early stages of breastfeeding. However, the use of ionizing diagnostic methods has limited early diagnosis. This study aimed to monitor changes in bone mineral density and skeletal fragility during pregnancy and breastfeeding using the Radiofrequency Echographic Multi Spectrometry (REMS) technology integrated with clinical and nutritional data.

Materials and Methods: This study was conducted within the framework of the "Progetto Osteoporosi in Gravidanza (POI)" project from different centres in Italy. The inclusion criteria were: healthy Caucasian women in their first trimester of pregnancy. At the time of recruitment (T1), all participants underwent REMS densitometric scans of the proximal femur and completed the Predimed and AFEF questionnaires developed by the Fragility Fracture Observatory (FFO, Italy), to collect information on dietary habits and skeletal risk factors. Participants were re-evaluated in the third trimester of pregnancy (T2) through REMS ultrasound scanning of the femoral neck and the Predimed and AFEF questionnaires. Densitometric changes were analysed using paired t-tests.

Results: A total of 156 healthy women in their first trimester was recruited for the study (mean age = 32.7 ± 5.3 years and mean BMI = 23.4 ± 4.2 kg/ m²). Among these, 36% received a diagnosis of osteopenia (-1 < T-score < -2.5). To date, 28 patients have completed the follow-up at the third trimester. In this subgroup, a ~1.3% significant reduction in BMD was observed (BMD T1 = 0.767 ± 0.06 g/cm ^{2}; BMD T2 = 0.757 ± 0.07 g/cm^2 ; p = 0.01).

Conclusion(s): Although the study is ongoing, the results show that 36% of women received a diagnosis of osteopenia in the first trimester, with a tendency to worsen over time. The study highlights the importance of constant and early bone monitoring for preventive purposes in pregnant women. Thanks to its non-ionizing and accessible nature, REMS enables broad access to this patient group. Integrating nutritional assessment with REMS-based monitoring may support the development of a risk chart to prevent bone fragility during pregnancy and breastfeeding.

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SY6 REMS TECHNOLOGY IN CLINICAL PRACTICE: APPLICATIONS THAT ENHANCE OSTEOPOROSIS DIAGNOSIS

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Objective: Osteoporosis often remains clinically silent until a fragility fracture occurs, particularly in patients with secondary osteoporosis or multiple comorbidities, where fracture risk is frequently underestimated. Radiofrequency Echographic Multi Spectrometry (REMS) is a nonionizing technology that improves early diagnosis and fracture risk assessment, overcoming limitations of conventional densitometry. This review summarizes clinical evidence of REMS across different patient populations.

Materials and Methods: A review of REMS applications in several clinical settings was conducted. REMS measurements were compared with DXA for agreement, diagnostic performance, reproducibility, and ease of use.

Results: Clinical evidence confirms REMS applicability across multiple medical specialties. In endocrinology, REMS improves detection of bone fragility in conditions such as type 2 diabetes, obesity, eating disorders, and during hormone-based therapies, where DXA may underestimate fracture risk. In nephrology, REMS enables accurate bone evaluation in chronic kidney disease, peritoneal dialysis, and kidney transplantation by overcoming artefacts related to vascular calcifications. In rheumatology, REMS overcomes BMD overestimation often observed with DXA in the presence of osteoarthritis, spondyloarthritis and other inflammatory conditions. In geriatric and orthopedic settings, REMS supports fracture prevention and secondary fracture management through bedside assessments and accurate evaluation in the presence of vertebral deformities or prosthetic implants. In gynecology, REMS allows safe bone health monitoring across pregnancy, lactation, and menopause. In oncology, REMS facilitates early identification of therapy-induced bone loss and fracture risk stratification. Across specialties, REMS demonstrates high reproducibility, portability and diagnostic accuracy.

Conclusions: REMS expands access to osteoporosis diagnosis and fracture risk assessment, offering a safe, accurate, and portable alternative to conventional densitometry, including for previously underserved populations. Its broad applicability supports early diagnosis, personalized management, and continuity of care.

SY7 FROM INNOVATION TO CLINIC: REMS AS A BREAKTHROUGH TOOL IN OSTEOPOROSIS MANAGEMENT

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Objective: To illustrate the clinical value of REMS as an innovative tool in osteoporosis management, with practical insights into interpreting REMS-derived BMD.

Materials and Methods: Targeted literature review on REMS as an innovation transitioning into routine osteoporosis management. Evidence was synthesised from key methodological descriptions and clinical studies, with practical examples addressing the role of age/BMI in the REMS pathway and the ability to monitor BMD over time.

Results: REMS yields a BMD result derived from patient-specific ultrasound information. Anthropometric and demographic parameters are taken into account to place the measurement within an appropriate reference framework. Importantly, the measurement retains strong individual specificity, such that patients with the same age and BMI can display a broad spread of BMD values. In addition, REMS processing can identify and automatically exclude signals consistent with common artefacts (e.g., osteophytes, calcifications, prosthetic material), keeping the provided BMD representative of bone-related information. Across follow-up studies, REMS has demonstrated the ability to detect significant BMD changes over time, including decline during pregnancy (around −2% in reported series), early postpartum recovery (about +0.02 g/cm² at 1 month in one cohort), and measurable variations over 12-month monitoring in metabolic/therapeutic settings (e.g., adults with type 2 diabetes starting GLP-1 receptor agonist therapy; breast cancer patients undergoing aromatase inhibitor based therapy, with and without denosumab administration).

Conclusions: REMS represents a breakthrough tool for osteoporosis care, translating patient-specific bone information into BMD values that can support diagnosis and monitoring in several different clinical settings. REMS leverages spectral-model matching of raw backscatter signals against reference profiles (stratified by patient characteristics and skeletal site), which is a key technical enabler of its patient-specific BMD output in real-world pathways. Age and BMI are embedded in the workflow, but they are not the determinants of the final value, enabling substantial BMD variability to be captured among individuals with similar anthropometrics and supporting longitudinal assessment.

SY8 IDENTIFYING FRAGILITY BEFORE FRACTURES OCCUR: THE ADDED VALUE OF REMS IN OSTEOPOROSIS CARE

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Fragility fractures frequently represent the first clinical manifestation of osteoporosis, underscoring persistent challenges in the early identification of skeletal fragility. Radiofrequency Echographic Multi Spectrometry (REMS) has emerged as a non-ionising, ultrasound-based technique propose assessment.

An expanding body of evidence suggests that REMS-derived BMD correlates well with that derived from Dual-Energy X-ray Absorptiometry (DXA). The REMS Fragility Score, may provide additional information on skeletal microarchitecture that is independent of BMD. By automatically integrating T-Score and Fragility Score values, REMS identifies short-term fracture risk, enabling stratification into seven risk categories aligned with five-year fracture probability. Observational and comparative studies have reported associations between REMS parameters and fracture risk in selected clinical settings, including conditions known to affect bone quality such as diabetes mellitus and chronic kidney disease. REMS has also been evaluated in populations for whom conventional imaging may be less suitable or practical, including pregnant women, frail inpatients, paediatric cases and individuals with severe disability, reflecting its portability and important absence of ionising radiation.

Overall, REMS represents a potentially useful adjunct or alternative for osteoporosis assessment by integrating quantitative evaluation of bone density and bone quality with short-term fracture risk assessment. Its especial clinical value also lies in scenarios where conventional tools provide incomplete risk characterisation.

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