normal BMD, 48% (CI: 42–57%) of those with osteopenia and 50% (CI: 43–53%) of those with osteoporosis. Similar values were found in men and women and also if only patients with a fall from standing height had been included.

We conclude that nearly one out of two patients with a recent nonspine clinical fracture have undiagnosed morphometric vertebral fractures when measured by MXA, even when BMD is normal. MXA significantly increases the number of patients with the diagnosis of osteoporosis, even when more stringent criteria (any $H \leq$ 0.75) are applied.

(1) Genant et al. JBMR 1993, 1137

P169. Secondary osteoporosis in patients with a recent clinical fracture and low bone mineral density

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Osteoporosis is a multifactorial bone disease that results in fragility fractures with significant morbidity, mortality, health- and social costs. Relatively little attention has been paid to the medical evaluation of patients with a clinical fracture. We therefore investigated bone -and fall-related risks for fractures along with causes of secondary osteoporosis in patients admitted to the hospital because of a recent clinical fracture.

All patients older than 50 years, who presented at the hospital with a fracture, had fracture and fall risk evaluation according to the Dutch guidelines, including bone densitometry. Patients with a *T*-score ≤ -2.5 in the hip and/or spine were further investigated for secondary osteoporosis. We evaluated 100 consecutive and consenting patients, 73 women and 27 men with a mean age of 68 years (50–90 years). Sixty-six had contributors to secondary osteoporosis. Forty-one patients had previously undiagnosed vitamin D deficiency (≤50 nmol/l), 28 had endocrine diseases (13 known thyroid pathologies, 1 primary, 5 secondary undiagnosed hyperparathyroidism (PTH >5.5 pmol/l), three men had unknown hypogonadism (testosterone <9.4 nmol/l), 14 had known renal insufficiency (creatinine clearance <40 ml/min)), six had inflammatory rheumatic diseases and four men had alcohol abuse. Thirty patients reported history of non-vertebral fracture and one history of a clinical vertebral fracture. On morphometry 61 patients had prevalent vertebral fractures. There were 54 patients with clinical fracture risks (73 when morphometry included), 79 had fall risks and 61 had both fall and fracture risks, including morphometric vertebral fractures.

We conclude that secondary osteoporosis is frequent in patients entering the hospital with a recent clinical fracture and a *T*-score ≤ -2.5. Nearly two in three had previously undiagnosed morphometric vertebral fractures.

P170. Clinical risk evaluation contributes to case finding and diagnosis of osteoporosis in postmenopausal women

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Clinical case finding for those at risk of osteoporosis and fractures is advocated in all guidelines of osteoporosis, but its application in daily practice remains unsatisfactory. We studied the effects of clinical fracture risk evaluation on case finding and diagnosis of osteoporosis in postmenopausal women consulted by their general practitioner (GP).

From 42,690 postmenopausal women age, weight and history of fractures after the menopause were recorded by 1,080 GPs. The OST index was calculated from age and weight as integer of (0.2 times [weight—age]).(1) An OST of >1 indicated low risk (LR), −3 to 1 moderate risk (MR) and <−3 high risk (HR). A prior DXA had been performed in 6,637 women (16%) in 7% in the LR, 22% in the MR and 26% in the HR.

After clinical evaluation 10,841 (29%) additional women were sent for DXA ($p<0.001$ vs. number (16%) of those with prior DXA): in 8% of the LR, 47% of the MR and 72% of the HR ($p<0.001$ for distribution between risk groups compared to patients with prior DXA). New cases of osteoporosis in the spine and/or hip were found in 2,353 (7%) of all clinically evaluated patients and in 23% of those send for DXA (15% of the LR, 27% of the MR and 47% of the HR, $p<0.001$ between risk groups).

A history of fracture after age 50 was present in 6,732 (16%) of all women (in 8% of the LR, 19% of the MR and 42% of the HR) ($p<0.001$). Altogether 27% of patients with a previous fracture had a prior DXA, compared to 13% of women without fracture history ($p<0.001$). After clinical evaluation, 66% of patients with a fracture history, but not having had a DXA, were sent for DXA ($p<0.001$). In these patients, 979 (32%) new cases of osteoporosis were diagnosed (21% in the LR 36% in the MR and 57% in the HR, $p<0.001$). In patients without a fracture history, 13% had a prior DXA. After OST evaluation, 24%

additional women were referred to DXA ($p<0.001$ vs. prior DXA), 50% of the LR, 83% of the MR and 72% of the HR ($p<0.01$). New cases of osteoporosis were diagnosed in 1,477 (20%) of those send for DXA (12% in the LR, 23% in the MR and 40% in the HR, $p<0.001$).

We conclude that clinical screening in postmenopausal women using fracture history and the OST-index tripled the proportion of women referred for DXA, with a significant shift towards referring more women at high risk.

(1) Geusens et al. Mayo Clin Proc, 2002, 629

P171. Influencing of Glucosamine Sulphate at cartilage morphological changes in osteoarthritis

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Background: Osteoarthritis is the most prevalent type of arthritis. Glucosamine Sulphate (GS) was shown to be an effective slow acting chondroprotective drug in OA. However the mechanism responsible for the chondroprotective effects of GS has not been documented yet.

Objectives: The objective of this study was to use ultrasound and MRI examination to visualize the quantitative structural changes induced by glucosamine sulphate treatment in patients with knee OA.

Materials and methods: A cohort of 75 patients suffering from knee OA, average age 56 years was studied. A control group of 30 OA patients of a matched age and clinical stage was included. The patients received 1,500 mg of glucosamine sulphate daily for 12 months after informed consent. The control group continuted their classical treatment without taking GS. The HDI 3000 ATL US machine, equipped with 5–12 MHz linear transducer was used. MRI 0.5 T using axial T1/wt, T2/.wt axial Fat saturated FSE and coronal or sagittal fast STIR sequences were used to measure the thickness of the articular cartilage at baseline, 6 months, 1 year following glucosamine treatment.

Results: Pretreatment cartilage defects, diffuse cartilaginous thinning, partial thickness or full thickness irregularities with and without subchondral cyst and/or sclerosis and bone marrow edema, were the most common findings seen in OA knee cartilage of the study population. Following GS treatment, both ultrasound and MRI images showed a significant improvement in the quality of the three layers of knee articular cartilage (superficial, intermediate and deep layers) in 74.2% of patients. The cartilage outlines became well defined in 63.6%. The echotexture showed a significant decrease of echogenic white dots in 82.4%. The diffuse cartilage thinning of both medial and lateral compartments had a substantial increase of thickness compared to pretreatment measurement in 74.9% of patients. The post-treatment recorded articular cartilage measurments were statiscally significant compared to the controlled group $P<0.5$.

Conclusion: Following glucosamine sulphate treatment of patients with knee osteoarthritis, both ultrasound and MRI images showed a significant improvement in the quality of the three layers of knee articular cartilage. The cartilage outlines became well defined. The U/S echotexture showed a significant decrease of echogenic white dots. This study provides reliable imaging evidences for the effectivness of glucosamine sulphate treatment in patients suffering from knee osteoarthritis.

P172. Comparison of analgesic effects of etidronate, alendronate and risedronate by measurement of fall of skin impedance

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Measurement of exercise—induced fall of skin impedance parallelling pain in electroalgometry (EAM) has made it possible to evaluate pain objectively and quantitatively. In 602 patients with back and knee pain due to osteoporosis and/or osteoarthritis, fall of skin impedance in response to standing and squatting (knee load), walking and climbing (combined load), and lying and rising (spine load) was measured along with recording of subjective pain by visual rating scale (VRS). Highly significant correlation ($p<0.0001$) was found between EAM—measured and VRS—recorded pain. All three bisphosphonates, alendronate (5 mg/day) (A), etidronate (200 mg/day) (E) and risedronate (2.5 mg/day) (R) administered for 12 months exerted analgesic effects on both EAM and VRS pain. EAM pain expressed as % fall of skin impedance from pre-load level was the least, 2±0.5 after knee load on A, followed by 13±0.5 on E, and 14±0.7 on R (Mean ± SEM, $p=0.0004$ between A and E and 0.0001 between A and R, Fisher's PLSD). Combined load gave the least pain, 23±0.9 on E, followed by 25±1.5 on A and 29±1.1 on R ($p=0.0265$ between E and A and 0.0001 between E and R). Spine load gave the least pain, 25 ±4.1 on E followed by 29±4.4 on A and 32±5.8 on R. Mean and maximum pain alleviation by E was distinctly better than that by R ($p<0.0001$) but A was not ($p=0.0403$ and ns). On E, the degree of reduction of EAM pain after/before treatment indicating a pain alleviation was significantly higher than unity after combined load ($p=0.0258$) and, spine load ($p=0.0006$), and in mean ($p=0.0079$) and maximum response to all exercise load ($p=0.0419$), but only after knee load ($p=0.0498$) on A. VRS pain showed significant reduction on R after knee, combined and spine load, and in mean and maximum response, but only after spine load and in maximum