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Search details
Patients with osteoporosis with vertebral fracture assessment and spinal x-rays

Resources searched
NHS Evidence; National Library for Health; TRIP Database; MEDLINE; EMBASE; CINAHL; Google Scholar

Database search terms: osteoporosis; exp OSTEOPOROSIS; “low bone density”; BONE DENSITY; low; “bone loss”; x-rays; xrays; “x rays”; RADIOGRAPHY; DXA; DEXA; ABSORPTIMETRY, PHOTON; “vertebral fracture assessment”; VFA; “instant vertebral assessment”; IVA; SPINAL FRACTURES; assessment; analysis; diagnosis; spin* radiograph; radiograph*

Google search string:

Summary
Seems to be quite a bit of research comparing DEXA with x-rays but I have found no research covering patients who have a DEXA scan followed by a spinal x-ray at a later date. I have included comparative research, which I hope you find relevant. Apologies if you have seen some of it before in your last search summary. I include my search strategy just in case I have misunderstood your requirements and you can think of new keywords or a new way of combining them.

Guidelines
American College of Radiology
Osteoporosis and bone mineral density 2008

Evidence-based reviews
None found.
1. [No need to change the practice guideline for the case finding of osteoporosis].
   [Dutch] Voorzichtig met aanpassen richtlijn osteoporose.

Author(s): Elders PJ

Citation: Nederlands Tijdschrift voor Geneeskunde, 2010, vol./is. 154/1(A419), 0028-2162;1876-8784 (2010)

Publication Date: 2010

Abstract: Case finding of osteoporosis according to the Dutch practice guidelines detects only a small group of patients. Only patients with severe risk factors for osteoporotic fractures are screened because the sensitivity of the case finding method is too low to screen moderate or low risk patients. The assessment of vertebral fractures will improve the prediction of the fracture risk. Including a spinal radiograph in the screening program is likely to be cost-ineffective because a vertebral deformity without low bone mineral density is at most only a moderate risk factor for future fractures. Extending the screening program with dual energy X-ray morphometry might be a good alternative regarding cost, effort and radiation dosage.

Source: MEDLINE

2. Spine radiographs to improve the identification of women at high risk for fractures.


Citation: Osteoporosis International, August 2009, vol./is. 20/8(1347-52), 0937-941X;1433-2965 (2009 Aug)

Publication Date: August 2009

Abstract: SUMMARY: In women older than 60 years with clinical risk factors for osteoporosis but without osteoporosis based on bone mineral density (T-score \( \geq -2.5 \)), a systematic survey with X-rays of the spine identified previously unknown vertebral deformities in 21% of women. INTRODUCTION: This study determines the prevalence of vertebral deformities in elderly women with clinical risk factors for osteoporosis but with BMD values above the threshold for osteoporosis (T-score \( > -2.5 \)). METHODS: Bisphosphonate naive women older than 60 years attending 35 general practices in the Netherlands with \( > 2 \) clinical risk factors for osteoporosis were invited for BMD measurement (DXA). In women with T-score \( > -2.5 \) at both spine and the hips, lateral radiographs of the thoracic and lumbar spine were performed. RESULTS: Of 631 women with a DXA measurement, 187 (30%) had osteoporosis (T-score < -2.5 at the spine or the hip). Of the remaining 444 women with T-score \( > -2.5 \) at both spine and hip, 387 had additional spine radiographs, of whom 80 (21%) had at least one vertebral deformity. CONCLUSION: In elderly women with clinical risk factors for osteoporosis but BMD T-score \( > -2.5 \), addition of spine radiographs identified vertebral deformities in 21% (95% CI: 17-25). Since these women are at risk of future fractures, antiosteoporotic treatment should be considered.

Source: MEDLINE


Author(s): Grados F, Fechtenbaum J, Flipon E, Kolta S, Roux C, Fardellone P

Citation: Joint, Bone, Spine: Revue du Rhumatisme, May 2009, vol./is. 76/3(241-7), 1297-319X;1778-7254 (2009 May)

Publication Date: May 2009
Abstract: Reproducible methods for the radiological assessment of osteoporotic vertebral fractures, defined based on accurate criteria, are needed in everyday practice and in therapeutic trials and epidemiological studies. OBJECTIVES: To describe and to evaluate methods for osteoporotic vertebral fracture assessment based on standard radiographs or dual-energy X-ray absorptiometry (DXA) and to determine the role for each method in clinical practice, therapeutic trials, and epidemiological studies. METHODS: A review written by a rheumatologist based on his clinical experience and on a literature review was submitted to four experts. Studies in English or French published between 1975 and February 2008 were retrieved from Medline using the keywords vertebral fracture, osteoporosis, vertebral deformity, and vertebral fracture assessment. RESULTS: One hundred forty-nine articles were selected and read in their full-text version. There was no consensus regarding the definition of osteoporotic vertebral fractures. The following methods were evaluated: visual assessment, Genant's semi-quantitative assessment, Jiang's algorithm-based qualitative method, morphometric radiography, and DXA of the spine. In everyday practice, Genant's semi-quantitative assessment on standard radiographs may provide useful information on the severity and prognosis of osteoporosis. DXA done for bone mineral density measurement may detect vertebral fractures in asymptomatic patients. Assessment of standard radiographs remains the reference standard for diagnosing vertebral fractures in patients with suggestive symptoms (e.g., pain in the thoracic or lumbar spine, height loss, or thoracic kyphosis). For therapeutic trials and epidemiological studies, Genant's semi-quantitative assessment used by a trained and experienced observer is the preferred method, based on its good reproducibility and ability to differentiate fractures from other deformities. However, thousands of radiographs may be needed, making routine interpretation by an expert impractical. A visual semi-quantitative method may be used to separate normal radiographs from radiographs showing possible or obvious fractures, which can then be read by an expert. Alternatively, radiomorphometric indices can be determined on digitized radiographs in combination with a semi-quantitative assessment, with discordant cases being reviewed by an expert. We do not recommend Jiang's method at present, as it is still undergoing validation.

Source: MEDLINE


Citation: Osteoporosis International, July 2009, vol./is. 20/7(1199-205), 0937-941X;1433-2965 (2009 Jul)

Publication Date: July 2009

Abstract: SUMMARY: The utility of vertebral fracture assessment (VFA) by DXA to detect prevalent vertebral fracture in a multicenter setting was investigated by comparison to conventional radiography. While limited by lower image quality, overall performance of VFA was good but had a tendency to miss mild prevalent fractures. INTRODUCTION: In osteoporosis clinical trials standardized spine radiographs are used to detect vertebral fractures as a study endpoint. Lateral spine imaging with dual X-ray absorptiometry (DXA) scanners, known as vertebral fracture assessment (VFA) by DXA, presents a potential alternative to conventional radiography with lower radiation dose and greater patient convenience. METHODS: We investigated in a multicenter setting the ability of VFA to detect fractures in comparison with conventional radiography. The study examined 203 postmenopausal women who had imaging of the spine by DXA and radiography. Three radiologists experienced in vertebral fracture assessment independently read the VFA scans and radiographs using the Genant semiquantitative method on two occasions. CONCLUSIONS: Analyzing the data from all readable vertebrae, the kappa statistic, sensitivity, and specificity ranged from 0.64-0.77, 0.65-0.84, and 0.97-0.98, respectively. Considering only moderate and severe fractures improved the kappa statistic (0.80-0.91) and sensitivity (0.70-0.86). While image quality of VFA is inferior to radiography, the detection of vertebral fractures using visual scoring is feasible. However, VFA underperformed due to unreadable vertebrae and reduced sensitivity for mild fractures. Nevertheless, VFA correctly identified most moderate and severe vertebral fractures.
Despite this limitation, VFA by DXA provides an important tool for clinical research.

Source: MEDLINE

5. **Computer-based screening of chest X-rays for vertebral compression fractures as an osteoporosis index in men.**

Author(s): Nakai Y, Noth R, Wexler J, Volpp B, Tsodikov A, Swislocki A

Citation: Bone, June 2008, vol./is. 42/6(1214-8), 8756-3282;1873-2763 (2008 Jun)

Publication Date: June 2008

Abstract: We evaluated the recognition of osteoporosis in the veteran male population through a computer-based review of chest X-ray (CXR) reports in the Veterans Affairs Northern California Health Care System database, looking for unrecognized vertebral fractures. All CXR reports between January 1, 2000 and December 31, 2001, were scanned for the terms "compression" or "wedg (where the " indicates a wild card search encompassing such terms as "wedge" or "wedging")". During this time, 26,994 CXR examinations were performed on 18,069 patients. 22,494 (83.3% of the total) CXR examinations were done in 14,561 men >or=50 years of age. 780 CXR reports (3.5%) encompassing 664 men (4.5%) contained at least one key phrase suggesting osteoporosis. Three years later, 495 of these 664 men were still living. 99 of these (20%) had been diagnosed with osteoporosis, 72 (15%) had a dual-energy X-ray absorptiometry (DXA) scan, and 89 (18%) had ever been prescribed a bisphosphonate. Overall, only 126 (25%) men had chart documentation indicating some recognition by the provider of the abnormality reported on CXR. We conclude that a significant fraction of men >50 years old may have unrecognized osteoporosis severe enough to result in vertebral fracture. We conclude that computerized screening of CXR reports may represent an effective strategy to aid clinicians in identifying men at risk for further debilitating fractures.

Source: MEDLINE

6. **Recognizing and reporting vertebral fractures: reducing the risk of future osteoporotic fractures.**


Citation: Canadian Association of Radiologists Journal, February 2007, vol./is. 58/1(27-36), 0846-5371;0846-5371 (2007 Feb)

Publication Date: February 2007

Abstract: OBJECTIVE: Given the increasing evidence that vertebral fractures are underdiagnosed and not acted on, Osteoporosis Canada and the Canadian Association of Radiologists initiated a project to develop and publish a set of recommendations to promote and facilitate the diagnosis and reporting of vertebral fractures. OPTIONS: The identification of spinal fractures is not uniform. More than 65% of vertebral fractures cause no symptoms. It is also apparent that vertebral fractures are inadequately recognized when the opportunity for diagnosis arises fortuitously. It is to patients' benefit that radiologists report vertebral fractures evident on a chest or other radiograph, no matter how incidental to the immediate clinical indication for the examination. OUTCOMES: The present recommendations can help to close the gap in care in recognizing and treating vertebral fractures, to prevent future fractures and thus reduce the burden of osteoporosis-related morbidity and mortality, as well as fracture-related costs to the health care system. EVIDENCE: Several studies indicate that a gap exists in regard to the diagnosis of vertebral fractures and the clinical response following such diagnosis. All recommendations presented here are based on consensus. VALUES: These recommendations were developed by a multidisciplinary working group under the auspices of the Scientific Advisory Council of Osteoporosis Canada and the Canadian Association of Radiologists. BENEFITS, HARM, AND COSTS: Prevalent vertebral fractures have important clinical implications in terms of future fracture risk. Recognizing and reporting fractures incidental to radiologic examinations done for other reasons has the potential to reduce health care
costs by initiating further steps in osteoporosis diagnosis and appropriate therapy.

RECOMMENDATIONS: Physicians should be aware of the importance of vertebral fracture diagnosis in assessing future osteoporotic fracture risk. Vertebral fractures incidental to radiologic examinations done for other reasons should be identified and reported. Vertebral fractures should be assessed from lateral spinal or chest radiographs according to the semiquantitative method of Genant and colleagues. Grade II and Grade III fractures as classified by this method should be given the greatest emphasis. Semiquantitative fracture recognition should include the recognition of changes such as loss of vertebral end-plate parallelism, cortical interruptions, and quantitative changes in the anterior, midbody, and posterior heights of vertebral bodies. When spine radiographs are performed to assess the presence of vertebral fractures, anteroposterior examinations may assist in the initial evaluation. The standard follow-up need only consist of single lateral views of the thoracic and lumbar spine that include T4 to L4 vertebrae. The radiographic technique described in this paper, or a technique of comparable efficacy, should be used. Dual X-ray absorptiometry examinations that include lateral spinal morphological assessments (vertebral fracture assessment) may contribute to fracture recognition. Educational material about the clinical importance of vertebral fracture recognition as a potential indicator of future osteoporotic fracture risk with its associated morbidity and mortality should be directed to all physicians. VALIDATION: Recommendations were based on consensus opinion.

Source: MEDLINE


Author(s): Pollahne W, Pfeifer M, Minne HW

Citation: Wiener Medizinische Wochenschrift, 2007, vol./is. 157/23-24(593-605), 0043-5341;0043-5341 (2007)

Publication Date: 2007

Abstract: According to the recently published BoneEVA study, 7.8 million Germans (6.5 million women) are affected by osteoporosis. Of them, 4.3% experienced at least one clinical fracture. Only 21.7% were treated with an anti-osteoporotic drug, whereby only 10% received a bisphosphonate and 17% given calcium and vitamin D. On the other hand, as osteoporosis may be associated with severe pain in 90% of patients, analgesics are prescribed. The total direct costs attributable to osteoporosis amounted to Euro 5.4 billion in 2003. One out of three postmenopausal women and one out of five men over the age of 50 years will experience osteoporotic fractures unless preventive measures are undertaken. According to the German guidelines for diagnosis and treatment of osteoporosis, bone densitometry using dual energy x-ray absorptiometry (DXA) together with other clinical risk factors (previous low trauma fracture, use of nicotine, low body weight [BMI<20 kg/m2], immobilisation, and more than two falls during the last six months) are recommended for diagnosis. Using typical cases out of clinical practice, this article delineates frequent mistakes in the interpretation of DXA measurements. Furthermore, the present paper clarifies the role of classical x-rays, which still represent the predominant procedure for the identification of fractures and especially vertebral fractures. In comparison to x-rays, CT or MRI are more important in differential diagnosis of malignant disease and bone metastases. Essentially a reduction of vertebral height without evidence of central endplate fracture in postmenopausal women may be unrelated to osteoporosis. Quantitative morphometry should not be used alone for the assessment of vertebral fracture in clinical decision-making. Therefore, we recommend differential diagnosis of morphometric vertebral deformities by an expert reader to rule out deformities related to degenerative disease and norm variants of which we will present several examples to train the view of the reader.

Source: MEDLINE

8. Diagnosis of vertebral fractures by vertebral fracture assessment.
Vertebral fractures are independent risk factors for both vertebral and peripheral fractures and only one-third of these fractures come to clinical attention. Vertebral fracture assessment (VFA) is a radiographic method using dual X-ray absorptiometry (DXA) to assess vertebral deformities during bone density measurement. We performed VFA of the spine from T4 to L5 on a Delphi W device (Hologic, Bedford, MA) in 136 postmenopausal patients (69+/-10 yr). These patients also had X-rays of the thoracic and lumbar spine. VFA was independently compared with X-rays by two rheumatologists, for the diagnosis of vertebral fractures at both the patient and vertebral levels. Using X-rays, 61 patients (45%) had at least one vertebral fracture. The percentage of unreadable vertebrae was 1% and 12.4% on X-rays and VFA, respectively (p<0.0001). At the patient level, VFA allowed to diagnose if the patient had no fracture or had at least one fracture in 74% of patients. In 11.2% of cases, VFA misclassified the patients. At the vertebral level, diagnostic efficacy of VFA as compared with X-rays was 97%. Concordance between both observers was good (kappa-score=0.69). We designed an algorithm for decision of performing X-rays in postmenopausal women: Using results of VFA would avoid X-rays in 32% of our patients. VFA is a reliable technique with low radiation, and is easily and rapidly applicable during bone density measurement by DXA, which could improve management of osteoporotic patients.

Source: MEDLINE
10. Effectiveness of instant vertebral assessment to detect prevalent vertebral fracture.

Author(s): Chapurlat RD, Duboeuf F, Marion-Audibert HO, Kalpakcioglu B, Mitlak BH, Delmas PD

Citation: Osteoporosis International, 2006, vol./is. 17/8(1189-95), 0937-941X;0937-941X (2006)

Publication Date: 2006

Abstract: INTRODUCTION: Vertebral fracture is currently underdiagnosed, despite its common severity and its value to predict further osteoporotic fracture. Morphometry using dual X-ray absorptiometry (DXA) [vertebral fracture assessment (VFA)] is a new technique that may facilitate detection of many vertebral fractures, as images are obtained at the same time as bone mineral density (BMD) measurement, and would also allow avoiding spine radiographs. METHODS: We conducted a cross-sectional study to assess the diagnostic value of Instant Vertebral Assessment (IVA), which is a morphometry scan using the Hologic Delphi densitometer, to detect prevalent vertebral fracture in postmenopausal women. Interobserver precision was assessed, then IVA scans were compared with lateral spine radiographs, considered the gold standard, to test diagnostic agreement between the two techniques. Sensitivity, specificity and predictive values were calculated, as well as the likelihood ratio of the positive test, using sensitivity and specificity at each vertebral level. RESULTS: Among 85 patients of whom 50% had at least one vertebral fracture identified with radiographs, we found that interobserver precision was moderate, with frequent difficulties in discerning upper thoracic vertebrae. On a per-vertebra basis, sensitivity was around 70% from L4 to T11 and lower above T11 whereas specificity was above 90% for all vertebrae, and the negative predictive value remained above 80% from L4 to T7 and decreased above T7. On a per-patient basis, sensitivity was 0.69, specificity 0.74, positive predictive value equalled 0.72 and negative predictive value 0.71. When only grades 2 and 3 fractures were considered, results were comparable, with slightly improved specificity. Then, with the likelihood ratios calculated in our sample, we obtained posttest probabilities using the prevalence of vertebral fracture at lumbar and thoracic levels in a large sample of postmenopausal women with osteopenia and osteoporosis with and without vertebral fracture [baseline data in women of the Multiple Outcomes on Raloxifene Evaluation (MORE) trial]. At levels where fractures were most common, likelihood ratios of the positive test were good or excellent, associated with sizeable posttest probabilities. CONCLUSION: IVA allowed diagnosis of vertebral fracture at levels where vertebral fracture were most common, i.e., the lumbar and mid and lower thoracic levels, but its value was weaker at the upper thoracic levels.

Source: MEDLINE

11. Whom to treat? The contribution of vertebral X-rays to risk-based algorithms for fracture prediction. Results from the European Prospective Osteoporosis Study.


Citation: Osteoporosis International, 2006, vol./is. 17/9(1369-81), 0937-941X;0937-941X (2006)

Publication Date: 2006

Abstract: INTRODUCTION: Vertebral fracture is a strong risk factor for future spine and hip fractures; yet recent data suggest that only 5-20% of subjects with a spine fracture are identified in primary care. We aimed to develop easily applicable algorithms predicting a
high risk of future spine fracture in men and women over 50 years of age. METHODS: Data was analysed from 5,561 men and women aged 50+ years participating in the European Prospective Osteoporosis Study (EPOS). Lateral thoracic and lumbar spine radiographs were taken at baseline and at an average of 3.8 years later. These were evaluated by an experienced radiologist. The risk of a new (incident) vertebral fracture was modelled as a function of age, number of prevalent vertebral fractures, height loss, sex and other fracture history reported by the subject, including limb fractures occurring between X-rays. Receiver Operating Characteristic (ROC) curves were used to compare the predictive ability of models. RESULTS: In a negative binomial regression model without baseline X-ray data, the risk of incident vertebral fracture significantly increased with age [RR 1.74, 95% CI (1.44, 2.10) per decade], height loss [1.08 (1.04, 1.12) per cm decrease], female sex [1.48 (1.05, 2.09)], and recalled fracture history; [1.65 (1.15, 2.38) to 3.03 (1.66, 5.54)] according to fracture site. Baseline radiological assessment of prevalent vertebral fracture significantly improved the areas subtended by ROC curves from 0.71 (0.67, 0.74) to 0.74 (0.70, 0.77) P=0.013 for predicting 1+ incident fracture; and from 0.74 (0.67, 0.81) to 0.83 (0.76, 0.90) P=0.001 for 2+ incident fractures. Age, sex and height loss remained independently predictive. The relative risk of a new vertebral fracture increased with the number of prevalent vertebral fractures present from 3.08 (2.10, 4.52) for 1 fracture to 9.36 (5.72, 15.32) for 3+. At a specificity of 90%, the model including X-ray data improved the sensitivity for predicting 2+ and 1+ incident fractures by 6 and 4 fold respectively compared with random guessing. At 75% specificity the improvements were 3.2 and 2.4 fold respectively. With the modelling restricted to the subjects who had BMD measurements (n=2,409), the AUC for predicting 1+ vs. 0 incident vertebral fractures improved from 0.72 (0.66, 0.79) to 0.76 (0.71, 0.82) upon adding femoral neck BMD (P=0.010). CONCLUSION: We conclude that for those with existing vertebral fractures, an accurately read spine X-ray will form a central component in future algorithms for targeting treatment, especially to the most vulnerable. The sensitivity of this approach to identifying vertebral fracture cases requiring anti-osteoporosis treatment, even when X-rays are ordered highly selectively, exceeds by a large margin the current standard of practice as recorded anywhere in the world.

Source: MEDLINE

12. Reporting of vertebral fractures on spine X-rays.

Author(s): Fechtenbaum J, Cropet C, Kolta S, Verdoncq B, Orcel P, Roux C

Citation: Osteoporosis International, December 2005, vol./is. 16/12(1823-6), 0937-941X;0937-941X (2005 Dec)

Publication Date: December 2005

Abstract: Vertebral fractures are the hallmark of osteoporosis, responsible for increased morbidity and mortality in post-menopausal women. However, two-thirds of vertebral fractures do not come to clinical attention. The aim of this study was to compare the identification of vertebral fractures on spine X-rays among rheumatologists. Study subjects were women aged 60-80 years having potential signs of vertebral fracture and visiting a rheumatologist. X-rays were performed according to standardized procedures. In 629 patients (among 824 included) at least one vertebral fracture was diagnosed, and the X-rays were then sent to a central facility where a semi-quantitative assessment of vertebral fracture was performed by a single rheumatologist trained for this evaluation. According to the vertebral level, kappa scores were between 0.20 to 0.77, i.e., below 0.6 from T4 to T7, and between 0.6 and 0.77 from T8 to L4. The false-negative fractures rate was 25.8% (and 15.7% of them were related to a numbering discrepancy). The rate of false positive fractures was 6.3%. At the patient level 6.8% had actually no fracture. This study shows that 25% of overall vertebral fractures are not diagnosed among patients considered as having at least one fracture. As a consequence, patients who require treatment to reduce fracture risk are not being properly identified.

Source: MEDLINE

13. Comparison of dual-energy X-ray absorptiometry and conventional radiography for the detection of vertebral fractures.
Author(s): Pavlov L, Gamble GD, Reid IR

Citation: Journal of Clinical Densitometry, 2005, vol./is. 8/4(379-85), 1094-6950;1094-6950 (2005)

Publication Date: 2005

Abstract: Prevalent vertebral fractures confer a high risk of subsequent fractures; therefore, fracture identification is a key issue in osteoporosis management. Dual-energy X-ray absorptiometry has become the most widespread technique for the assessment of bone density, and can also provide images for assessment of vertebral morphometry (MXA) that are undistorted by parallax. The radiation dose is very low compared with conventional radiography. Whether the resolution of MXA is adequate for vertebral morphometry is uncertain. The present study compares MXA with conventional radiography in detecting vertebral deformities. MXA scans and lateral radiographs were performed in 61 women with osteoporosis. Adequate images were obtained in 99.1% of the 793 vertebrae by radiography and 95.6% by MXA. Poor image quality was mostly at T4-6 by MXA. Precision of repeat analyses was comparable between the techniques. Heights measured by MXA were 24 to 35% less than the radiographic values, the methods produced equivalent results for the ratio of anterior to posterior heights, but the MXA values for middle to posterior ratios were about 10% lower than for the radiographs (p < 0.0001). The extent of agreement between the techniques in identifying vertebral fractures was dependent on the strictness of the fracture definition used. With a 3 standard deviation (SD) criterion, the techniques found similar numbers of patients to have vertebral deformities, and the concordance in classification of individual vertebrae was 94%. At a 2 SD, cut-off concordance was 79%, and at 4 SD, it was 96%. Receiver-operating characteristic curves using cut-offs of > or = 3 SDs also showed excellent diagnostic accuracy. We conclude that MXA shows acceptable performance for clinical use in diagnosing vertebral deformities, as long as cut-offs of > or = 3 SDs are used, although a few percent of vertebrae in the upper thoracic region cannot be imaged adequately using this technique.

Source: MEDLINE

14. Lateral vertebral assessment: a valuable technique to detect clinically significant vertebral fractures.

Author(s): Binkley N, Krueger D, Gangnon R, Genant HK, Drezner MK

Citation: Osteoporosis International, December 2005, vol./is. 16/12(1513-8), 0937-941X;0937-941X (2005 Dec)

Publication Date: December 2005

Abstract: Although many vertebral fractures are clinically silent, they are associated with increased risk for subsequent osteoporotic fractures. A substantial number of these fractures are demonstrable using instant vertebral assessment with Hologic densitometers. Whether similar recognition is possible using dual-energy lateral vertebral assessment (LVA) with GE Lunar densitometers remains uncertain. Thus, we evaluated the ability of clinicians using LVA to detect prevalent vertebral fractures. Dual-energy LVA and conventional thoracic and lumbar spine radiographs were concurrently obtained in 80 postmenopausal women. Using an established visual semiquantitative system, vertebral fractures were identified individually by two non-radiologist clinicians on LVA images, and the results were compared with spinal radiograph evaluation by an expert radiologist. Using LVA, 95% of vertebral bodies from T7 through L4 were evaluable, but a majority (66%) of vertebrae from T4 to T6 were not adequately visualized. In the LVA-evaluable vertebrae, prevalent fractures were identified in 40 vertebral bodies from T7 through L4 were evaluable, but a majority (66%) of vertebrae from T4 to T6 were not adequately visualized. In the LVA-evaluable vertebrae, prevalent fractures were identified in 40 vertebral bodies by radiography. In this regard, the clinicians using LVA detected 17 of 18 radiographically evident vertebral fractures of grade 2 or 3, a false negative rate of 6%. They identified 50% (11/22) of grade 1 fractures. Additionally, the vast majority of evaluable non-fractured vertebrae, (764/794, 96.2%) were correctly classified as normal by LVA. Thus, clinicians utilizing LVA correctly identified the vast majority of grade 2 or 3 vertebral compression fractures and normal vertebral bodies, although detection of grade 1 fractures was less effective. In conclusion, the low-radiation, dual-energy LVA technique provides a rapid and convenient way for clinicians to identify patients with, and without, grade 2 or 3 vertebral fractures, thereby enhancing care of
15. Assessment of vertebral fracture using densitometric morphometry.

Author(s): Duboeuf F, Bauer DC, Chapurlat RD, Dinten JM, Delmas P

Citation: Journal of Clinical Densitometry, 2005, vol./is. 8/3(362-8), 1094-6950;1094-6950 (2005)

Publication Date: 2005

Abstract: Diagnosis of vertebral fracture is critical for management of osteoporosis, as existence of such deformities substantially increases the risk of subsequent fracture. Thus, accurate and precise techniques allowing detection of such deformities are essential to clinicians. So far, this detection has been performed by spinal lateral X-rays. More advanced techniques have recently been developed, based on dual energy X-ray absorptiometry (DXA). This review describes these different techniques and discusses the effectiveness of the DXA technique to assess vertebral deformities compared to X-ray. The use of DXA detection of vertebral fracture for clinical practice and clinical trials is discussed. Specifically, vertebral morphometry using DXA provides an excellent specificity, with moderate sensitivity. The major limitation of the DXA vertebral assessment is the poor quality of images of thoracic vertebrae. The clinical utility of vertebral morphometry using densitometry may help screening patients with vertebral fracture, but technological improvements are necessary to improve image quality.

Source: MEDLINE


Author(s): Jacobs-Kosmin D, Sandorfi N, Murray H, Abruzzo JL

Citation: Journal of Clinical Densitometry, 2005, vol./is. 8/3(267-72), 1094-6950;1094-6950 (2005)

Publication Date: 2005

Abstract: Whether vertebral fractures identified on radiographs are painful or not, they are associated with increased morbidity and mortality. Vertebral fractures on X-rays correlate with low bone mineral density (BMD) at the spine and hip in addition to several clinical characteristics. Evidence suggests that vertebral deformities detected by X-ray and by vertebral fracture assessment (VFA) show good agreement. We examined the relationship between VFA-detected vertebral deformities and patient characteristics as well as BMD by analyzing the records of 432 patients who had undergone dual-energy X-ray absorptiometry (DXA) scans with VFA. Patients' demographic data and T-scores were obtained from patient questionnaires and DXA scans. We categorized vertebral deformities by type and severity. Patients with vertebral deformities were significantly older and more likely to report a history of fracture after childhood. Significantly more estrogen use was reported in patients without deformity. Those with deformities had significantly lower T-scores at the femoral neck and total hip but not at the spine. Increased severity and number of deformities correlated with lower T-scores at the total hip and femoral neck but not the spine. In conclusion, vertebral deformities detected by VFA, like those on X-ray, correlate with both clinical characteristics and reduced bone mass at the hip. These relationships, in addition to rapid performance, convenience, and minimal radiation exposure, indicate VFA-detected vertebral deformities are a valuable adjunct in identifying patients in need of additional evaluation and treatment.

Source: MEDLINE


Author(s): Ferrar L, Jiang G, Adams J, Eastell R
Abstract: Osteoporotic vertebral fracture is associated with increased morbidity and mortality. As a powerful predictor of future fracture risk, the identification of vertebral fracture helps target individuals who will benefit from anti-fracture therapy. The identification of vertebral fractures is problematic because (1) "normal" radiological appearances in the spine vary greatly both among and within individuals; (2) "normal" vertebrae may exhibit misleading radiological appearances due to radiographic projection error; and (3) "abnormal" appearances due to non-fracture deformities and normal variants are common, but can be difficult to differentiate from true vertebral fracture. Various methods of vertebral fracture definition have been proposed, but there is no agreed gold standard. Quantitative methods of vertebral fracture definition are objective and reproducible, but the major limitation of these methods is their inability to differentiate between vertebral deformity and vertebral fracture. The qualitative visual approach draws on the expertise of the reader, but it is a subjective method with poor interobserver agreement. Semiquantitative assessment of vertebral fracture is a standardized visual method, which is commonly applied in research studies as a surrogate gold standard. This method is more objective and reproducible than a purely qualitative approach, but can be difficult to apply. The established methods focus primarily on the identification of "reduced" or short vertebral height as an indication of vertebral fracture, but this is also a feature of some non-fracture deformities and normal variants. A modified visual approach known as algorithm-based qualitative assessment of vertebral fracture (ABQ) has recently been introduced, and this focuses on radiological evidence of change at the vertebral endplate as the primary indicator of fracture. Preliminary testing of the ABQ method has produced promising results, but the method requires further evaluation. Vertebral imaging by means of dual energy X-ray absorptiometry (DXA) scanner produces images of near-radiographic quality at a fraction of the radiation dose incurred by conventional radiography. There is growing interest in vertebral fracture assessment using this technique as a means of assessing a patient's fracture risk. Given the increasing availability of new technology and the importance of accurate diagnosis of vertebral fracture, there is an urgent need for better awareness of and training in the definition of vertebral fracture. Methods of vertebral fracture definition should be validated by testing the association with clinical outcomes of vertebral fracture, in particular the prediction of incident fractures.

Source: MEDLINE

EMBASE

18. Imaging of vertebral fracture in osteoporosis

Author(s): Skowronska-Jozwiak E., Bieganski T., Lewinski A.

Citation: Polish Journal of Radiology, 2008, vol./is. 73/3(46-52), 0137-7183 (2008)

Publication Date: 2008

Abstract: Vertebral collapses are the most frequent fractures in osteoporosis. They are often overlooked, although their presence is a strong risk factor for development of new fractures. Lateral radiographs of the spine are the accepted standard for assessment of fractures. Qualitative (visual), semiquantitative and quantitative (morphometric) techniques are useful in determining the compressive deformities of vertebral bodies. In the present paper, the advantages and the disadvantages of these methods are discussed. The improvement of scan quality allows to use DXA technique to diagnose the fractures, in both - the visual and the morphometric way. The vertebral morphologic assessment also seems to be an important diagnostic tool in pediatric osteoporosis. Application of multidetector CT and especially MR in vertebral imaging of osteoporosis, improves the sensitivity of fracture detection and enables the differentiation of benign from malignant vertebral body collapses. copyright Pol J Radiol.
19. Vertebral morphometry: Current methods and recent advances

Author(s): Guglielmi G., Diacinti D., van Kuijk C., Aparisi F., Krestan C., Adams J.E., Link T.M.

Citation: European Radiology, July 2008, vol./is. 18/7(1484-1496), 0938-7994 (Jul 2008)

Abstract: Vertebral fractures are the hallmark of osteoporosis and are associated with increased morbidity and mortality. Because a majority of vertebral fractures often occur in absence of specific trauma and are asymptomatic, their identification is radiographic. The two most widely used methods to determine the severity of vertebral fractures are the visual semiquantitative (SQ) assessment and the morphometric quantitative approach, involving the measurements of vertebral body heights. The measurements may be made on conventional spinal radiographs (MRX: morphometric X-ray radiography) or on images obtained from dual X-ray absorptiometry (DXA) scans (MXA: morphometric X-ray absorptiometry). The availability of a rapid, low-dose method for assessment of vertebral fractures, using advanced fan-beam DXA devices, provides a practical method for integrated assessment of BMD and vertebral fracture status. The visual or morphometric assessment of lateral DXA spine images may have a potential role for use as a prescreening tool, excluding normal subjects prior to performing conventional radiographs.

Source: EMBASE

20. Discrepancies between vertebral bone density values: The least dense vertebra

Author(s): Mylonakis A., Hadjidakis D., Katsavochristos P., Androulakis I.I., Sfakianakis M., Raptis S.A.

Citation: Maturitas, March 2006, vol./is. 53/4(476-482), 0378-5122 (20 Mar 2006)

Abstract: Vertebral bone mineral density (BMD) measurements by DXA are considered reliable indicators of local fracture risk in the absence of radiographic deformities. The clinical evaluation of one individual vertebra presenting a BMD value significantly less than the others is attempted in this study. For a period of 30 months, BMD measurements of L1-L4 vertebrae and femoral neck (FN) were performed by DXA in 817 postmenopausal women, aged under 65 years, with a BMI less than 33 kg/m². In 204 (25%) of these women (group A), the least dense vertebra (LDV) presented a BMD value lower than 92.4% from the immediate denser vertebra. The remaining 613 women comprised group B. Women with X-ray proven vertebral degenerative lesions or deformities were excluded from the study. Among the four measured vertebrae, L1 was the most frequent LDV (47%), whilst L3 was the most rare (2%). Absolute and age-adjusted BMD values of L1-L4 and FN, as well as the proportions of osteopenic or osteoporotic women, did not differ significantly between the two groups. A significant positive correlation was observed between either L1-L4 or LDV and FN BMD values in both groups, but stepwise multiple regression analysis revealed that in group A the LDV did not participate in the model explaining the variability of the FN BMD values. In group B, the least dense vertebra was the only variable participating in the respective model (adjusted-R² = 37.7%). It is concluded that in a significant proportion of relatively young postmenopausal women, a wide variance of BMD values exists between individual vertebral BMD values without radiographic background. L1 was the most frequent LDV and L3 the most rare. In such cases, the evaluation of the least dense vertebra seems to offer an alternative estimation of vertebral bone mass, instead of mean L1-L4.

Source: EMBASE

21. The relation between lumbar vertebra corpus heigh and bone mineral density in postmenopausal women
Author(s): Yaar E., Balaban B., Taskaynatan M.A., Ckar E., Alaca R., Mohur H.

Citation: Journal of Rheumatology and Medical Rehabilitation, December 2005, vol./is. 16/4(231-236), 1300-0691 (Dec 2005)

Publication Date: December 2005

Abstract: Osteoporosis is a systemic skeletal disease characterized with low bone density and bone tissue microarchitect that cause fragility. Vertebral fracture as a consequence of osteoporosis, is a risk factor for the occurrence of new fracture and it enhances morbidity. Recently, measurement of bone mineral density (BMD) with dual energy X-ray absorpsiometry (DEXA) has been used to diagnose osteoporosis and decide treatment. However, fracture is diagnosed with conventional radiographs. In this study of postmenopausal women, we investigated the relation between lumbar BMD and vertebral body height. Radiographic measurements were made on digital teleradiology system (PAC) to reduce the risk of miscalculation. It was observed that there was no correlation between BMD of L2, L3 and L4 vertebrae and their anterior, central and posterior height. Comparison between normal, osteopenic and osteoporotic subjects, showed that BMD of L2, L3, L4 vertebrae were quite different, but their heights were not. However, a mild correlation between concavity and BMD was found. As a result, we conclude that radiological measurements of lumbar spine can not reflect BMD values, however radiographic evaluation should be considered in the diagnosis of fractures.

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Qualitative and Quantitative Assessment of Bone Fragility and Fracture Healing Using Conventional Radiography and Advanced Imaging Technologies—Focus on
R Firoozabadi, S Morshed, K Engelke, S ... - Journal of ..., 2008 - journals.lww.com
... 9 Whereas conventional radiography has been the mainstay of fracture assessment, new technologies ... conclude whether fracture healing is measurably impaired in human patients with osteoporosis. ... FIGURE 2. Volumetric quantitative computed tomography of the spine may be ...

Utility of serial vertebral fracture assessment
N Vallarta-Ast, D Krueger, N ... - Journal of Clinical ..., 2007 - uwosteoporosis.org
... Ordinal data (medical and fracture history, steroid and bisphosphonate use, osteoporosis diagnosis) analyzed ... In the cohort with new fracture, total femur and femur neck BMD was lower and spine deformity index was greater. ... Utility of Serial Vertebral Fracture Assessment ...

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Vertebral fracture assessment using morphometry
E Skowrońska-Jóźwiak, A Lewiński - Terapia, 2006 - journals.indexcopernicus.com
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Search strategy
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