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Osteoporosis is characterized from Bone Mineral Density (BMD) and trabecular bone microarchitecture. BMD remains the standard tool for assessment of fracture risk. However, trabecular microarchitecture is considered to play a major role. We have previously developed and validated a reproducible fractal analysis of bone texture from radiographic films.

Aim of study: In vivo assessment of trabecular bone texture parameters on digital radiographic images in a multicenter case-control population with X-Ray prototype

Materials and methods

Subjects

Osteoporotic groups from 3 medical centers (Orleans-Cochin-Amiens)

- 147 healthy post-menopausal women (age: 71.4 ± 8.8 years old) without fracture
- 46 post-menopausal women (age: 75.6 ± 9.2 years old) with vertebral fracture
- 31 post-menopausal women (age: 80.1 ± 10.5 years old) with hip fracture

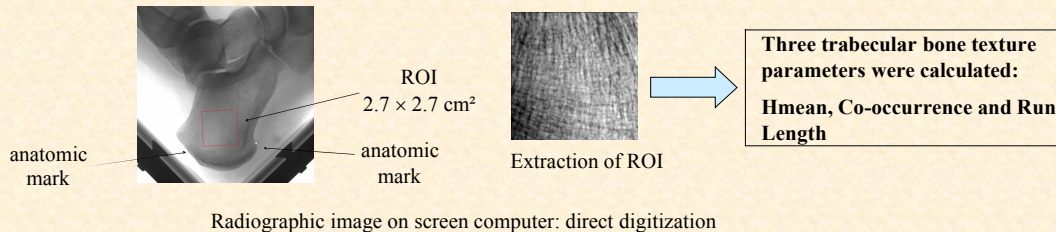
Osteopenic groups from 1 medical center (Orleans)

- 115 healthy post-menopausal women (age: 64.7 ± 10.0 years old) without fracture
- 74 post-menopausal women (age: 72.9 ± 9.3 years old) hip fracture (HF), vertebral fracture (VF), wrist fracture (WF) or other fractures (OF)

Methods

Bone Mineral Density measured by DXA (Hologic Delphi): at femoral neck (FN) total hip (TH) and lumbar spine (LS)

Trabecular bone texture parameters measured by calcaneus radiography with a home made radiologic prototype (20 mAs, 55 kV, focal distance 115 cm, pixel size 50 microns)



The anatomic marks localized by the operator, allowing the automatic positioning of the ROI

Statistical analysis

- Differences between fracture and control groups were evaluated using a one way ANCOVA test. Results were adjusted for age.
- Odds Ratio were calculated by a multivariate logistic model adjusted for age, weight and height

Results

We compared : - hip fracture (HF) group to control group (C)
 - vertebral fracture (VF) group to control group
 - hip and vertebral fracture (HF+VF) group to control group

Means ± SD	VF + HF	HF	VF	C
Hmean	0.592 ± 0.037 p < 0.0001	0.583 ± 0.034 p < 0.0001	0.598 ± 0.039 p = 0.0131	0.613 ± 0.032
Co-occurrence	0.0274 ± 0.0009 p = 0.0001	0.0272 ± 0.001 p = 0.0001	0.0275 ± 0.0008 p = 0.0002	0.0281 ± 0.001
Run lengths	0.7768 ± 0.0068 p < 0.0001	0.7779 ± 0.0074 p = 0.0001	0.7761 ± 0.0064 p = 0.0001	0.772 ± 0.006

- Co-occurrence matrices and Hmean values were significantly lower in hip, vertebral fracture, hip and vertebral fracture groups versus control group
- Run Length value was significantly higher in hip and vertebral fracture groups versus control group
- Vertebral fracture group was less significantly different than hip fracture group versus control group for the three parameters

Odds Ratio for osteopenic groups

	OR	CI 95%
BMD LS	3	1.5 - 6
Hmean	3.3	1.7 - 6.1
Co-occurrence	5	2.5 - 9.8
1 - Run lengths	6.1	3 - 12.1

Means ± SD	VF + HF+WF	HF	VF	WF	C
Hmean	0.605 ± 0.031 p = 0.0049	0.6 ± 0.031 p = 0.0434	0.61 ± 0.038 p = 0.5349	0.596 ± 0.038 p = 0.0129	0.616 ± 0.026
Co-occurrence	0.0276 ± 0.0007 p = 0.0009	0.0275 ± 0.0007 p = 0.041	0.0277 ± 0.0007 p = 0.1931	0.0277 ± 0.0008 p = 0.1201	0.0281 ± 0.001
Run lengths	0.774 ± 0.006 p < 0.0001	0.775 ± 0.006 p = 0.0101	0.774 ± 0.007 p = 0.079	0.774 ± 0.005 P = 0.0081	0.771 ± 0.006

Conclusion

These data have confirmed our previous studies showing that bone texture parameters can separate groups patients with osteoporotic fracture from control group.

These results in osteopenic women with or without fracture suggested that this analysis might be useful for assessing fracture risk independently of BMD measurements