STUDY OF THE RELATIONSHIP BETWEEN BONE MINERAL DENSITY (BMD) AND CAROTID ATHEROSCLEROSIS IN POSTMENOPAUSAL WOMEN

Thesis
Submitted for partial fulfillment of
M.D. Degree in Geriatric Medicine

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To

My parents,

My wife & my coming first baby.

M. Fouad

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مقدمة من

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List of abbreviations

1,25(OH)2D3	1,25-DIHYDROXYCHOLECALCIFEROL
ABI	ankle/brachial index
ALP	Alkaline phosphatase
BH4	Tetrahydrobiopterin
BMD	Bone mineral density
BMP	Bone Morphogenetic Proteins
Ca	Calcium
CAD	Coronary artery disease
Cbfa-1	Transcription factor
CCA	Common carotid artery
cNOS	Constitutively expressed nitric oxide synthetase
CSF	Colony stimulating factor
CT	Computed tomography
CVCs	Calcifying vascular cells
CVD	Cardiovascular disease
DHEAS	Dehydroepianderosterone
DM	Diabetes mellitus
DPA	Dual photon absorptiometry
DEXA	Dual Energy X-ray absorptiometry
E3	Estriol
EDR	Endothelium-dependent relaxation
EGF	Epidermal Growth Factor
eNOS	Endothelial nitric oxide synthetase
ER	Estrogen receptor
FGF	Fibroblast Growth Factors
FN	Femur neck
GDS	Geriatric Depression Scale
Gla protein	Gammacarboxy-glutamate protein

HbA1c	Glycosolated hemoglobin
HDL.Ch	High-density lipoprotein cholesterol
HMG-CoA	Hydroxymethylglutaryl coenzyme A
SMC	Smooth muscle cells
HTN	Hypertension
ICA	Internal carotid artery
IGF-1	Insulin-like growth factor-I
IL-1	Interleukin-1
IL-4	Interleukin-4
IL-6	Interleukin-6
IMT	Intima-media thickness
iNOS	Inducible form of nitric oxide synthetase
IVUS	Intravascular ultrasound
LBMD	Low bone mineral density
LDL.Ch	low-density lipoprotein cholesterol
LS	Lumbar spine
MCCA.IMT	Mean common carotid artery intima-media thickness
M-CSF	Macrophage colony-stimulating factor
Mg	Magnesium
MGP	Matrix Gla protein
MICA.IMT	Mean internal carotid artery intima-media thickness
MMSE	Mini-Mental Status Examination
MPCs	Mononuclear phagocytic cells
MRA	Magnetic resonance arteriography
mRNA	Messenger RNA
NO	Nitric oxide
NOS	Nitric oxide synthetase
OC	Osteocalcin

OCIF	Osteoclast inhibitory factor
ODF	Osteoclast-differentiating factor
OLCs	Osteoclast-like cells
OP	Osteoporosis
OPG	Osteoprotegren
OPGL	Osteoprotegren ligand
OPN	Osteopontin
Ox-LDL	Oxidized LDL
P	Phosphate
PAOD	Peripheral artery occlusive disease
PDGF	Platelet Derived Growth Factor
PGE_2	Prostaglandin E_2
PSV	Peak systolic velocity
PTH	Parathyroid hormone
QCT	Quantitative computed tomography
QUS	Quantitative ultrasound
RANKL	Receptor activator of nuclear factor-κ B ligand
SD	Standard deviation
SERM	Selective estrogen receptor modulators
SPA	Single photon absorptiometry
SXA	Single X-ray absorptiometry
TCh	Total cholesterol
TGF-β	Transforming Growth Factor β
TNF	Tumor necrosis factor
VDR	Vitamin D receptor
VLDL	Very low density lipoprotein
VSMCs	Vascular smooth muscle cells
WHO	World Health Organization

Introduction

Both osteoporosis and atherosclerosis increase in frequency with advancing age, both appear worse (or at least more frequent) in postmenopausal women ***(Watts, 2002).*** And these conditions account for most of morbidity and mortality in the aging population despite significant improvement in treatment ***(Parhami et al., 2000).***

Biological interaction between the bone and the blood vessels are gradually being clarified and evidence is accumulating for the link between the vascular and bone disease ***(Nakashima et al., 2003).***

Osteoporosis is associated with both atherosclerosis and vascular calcification ***(Ross, 1999).*** And osteoporotic women are at significantly greater risk for cardiovascular disease than age matched controls ***(Parhami et al., 2000).***

The observational studies suggest a relationship between osteoporosis and atherosclerosis with significant correlation between carotid –plaque score and bone mineral density, but some clinical trials suggest there may not be a relationship ***(cited in Watts, 2002).***

However, many clinical studies have shown that osteoporosis is associated with atherosclerosis and cardiovascular deaths ***(Yamaguchi et al., 2002).***

The association between arterial calcification or atherosclerosis and osteopenia is documented to be more prominent in females than in males and this relation is stronger after the menopause. These results suggest the presence of common or related mechanisms, which may be accelerated after

menopause, controlling both atherosclerosis and osteoporosis from the early stages ***(Ilirose et al., 2003).***

The exciting possibilities of newer pharmacological agents that effectively treat both osteoporosis and atherosclerotic diseases hold considerable promise ***(McFarlane et al., 2004).***

Aim of the work

The aim of the study is to test the hypothesis that there is a relationship between bone mineral density and atherosclerosis in postmenopausal women.