Value of Costo-iliac Distance in Evaluation of Patients with Osteoporosis

Thesis
Submitted for Partial Fulfillment of Master's Degree in **Family Medicine**

Submitted by
Manar Atya Abdel Maksoud Soliman

Supervised by
Prof. Essam Mohammed Bayomi Helal

Professor of Internal Medicine
Faculty of Medicine – Ain Shams University

Ass. Prof. Samia Ahmed Abdul-Rahman

Assistant Professor of Geriatrics and Gerontology
Faculty of Medicine – Ain Shams University

Ass. Prof. Ghada Essam Al-Din Amin

Assistant Professor at Community, Environment and
Occupational Medicine Department
Faculty of Medicine – Ain Shams University

**Faculty of Medicine
Ain Shams University
2018**

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا

سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

سورة البقرة الآية: ٣٢

Acknowledgment

First and foremost, I feel always indebted to **ALLAH**, *the Most Kind and Most Merciful.*

I'd like to express my respectful thanks and profound gratitude to **Prof. Essam Mohammed Bayomi Helal,** *Professor of Internal Medicine Faculty of Medicine – Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I am also delighted to express my deepest gratitude and thanks to **Ass. Prof. Samia Ahmed Abdul-Rahman,** *Assistant Professor of Geriatrics and Gerontology Faculty of Medicine – Ain Shams University, for her kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

I am deeply thankful to **Ass. Prof. Ghada Essam Al-Din Amin,** *Assistant Professor at Community, Environment and Occupational Medicine Department Faculty of Medicine – Ain Shams University, for her great help, active participation and guidance.*

Manar Atya

List of Contents

List of Tables

List of Tables Cont...

List of Figures

List of Abbreviations

Abb.	Full term
ARRT	American Registry of Radiologic Technologists
AS	Arm Span
BMD	Bone mineral density
BMI	Body mass index
CID	Costo-iliac distance
CT	Computed tomography
DEXA	Dual-energy X-ray absorptiometry
FRAX	Fracture Risk Assessment Tool
ISCD	International Society for Clinical Densitometry
IUD	Intra uterine devices
LSC	Least significant change
LSVH	Lumbar spine vertical height
MRI	Magnetic resonance imaging
NMTCB	Nuclear Medicine Technology Certification Board
NOF	National Osteoporosis Foundation
ORAI	Osteoporosis Risk Assessment Instrument
PTH	Parathyroid hormone
QA	Quality assurance
QCT	Quantitative computed tomography
QUS	Quantitative ultrasound
RANKL	Receptor activator of nuclear factor kappaB ligand
SCORE	Simple Calculated Osteoporosis Risk Estimation
SD	Standard deviation
SSRIs	Selective serotonin reuptake inhibitors
WHO	World Health Organization

INTRODUCTION

O steoporosis is a chronic progressive disease. It is defined as a systemic skeletal disease characterized by low bone density and micro-architectural deterioration of the bone tissue with a consequent increase in bone fragility that greatly increases the risk of fractures *(Reginster and Burlet, 2006)*.

It is a major public health problem, it is estimated to affect 200 million women worldwide and causes more than 8.9 million fractures annually *(Watts et al., 2010)*.

In 2014, the National Osteoporosis Foundation estimated that a total of 54 million adults aged 50 and older in USA are affected by osteoporosis and low bone mass *(Wright et al., 2014)*.

In Europe, in 2010 approximately 22 million women and 5.5 million men aged between 50 and 84 years are estimated to have osteoporosis *(Hernlund et al., 2013)*.

In Egypt, based on different studies, it has been calculated that 53.9% of post-menopausal women have osteopenia and 28.4% have osteoporosis. On the other hand, 26% of men have osteopenia and 21.9% have OP *(Taha, 2015)*.

Osteoporosis awareness has increased in the last 20 years with the introduction of several effective pharmaceutical agents for treating those at high risk *(Barrett, et al., 2012)*.

Osteoporosis is under-diagnosed disease *(Chesnut, 2001).* Yet prevention is better than treatment and osteoporosis is a preventable disease *(Ungan and Tumer, 2001).*

Dual-energy X-ray absorptiometry (DEXA) is the most widely used bone densitometric technique. It is versatile in the sense that it can be used to assess bone mineral content of the whole skeleton as well as of specific sites, including those most vulnerable to fracture *(Blake and Fogelman, 2007).*

The limitations of DEXA Bone Densitometry

1. A DEXA test cannot predict who will experience a fracture but can provide indications of relative risk.

2. Despite its effectiveness as a method of measuring bone density, DEXA is of limited use in people with a spinal deformity or those who have had previous spinal surgery. The presence of vertebral compression fractures or osteoarthritis may interfere with the accuracy of the test.

In this study, we are trying to avoid this limitations by using anew, simple, anatomical measurements as the Costo-iliac/Arm Span ratio.

The CID/AS ratio may be a useful bedside test in predicting osteoporosis.

AIM OF THE WORK

The aim of work of this study:

1. To determine the ratio between Costo-iliac distance and Arm span.

2. To know the validity of the Costo-iliac distance in early diagnosis of osteoporosis.

Chapter 1

OSTEOPOROSIS

Definition:

Osteoporosis is an asymptomatic systemic disease characterized by deterioration of the micro architecture of bone and low bone mass, which ultimately predisposes patients to fractures secondary to low-energy mechanisms *(McKean et al., 2013).*

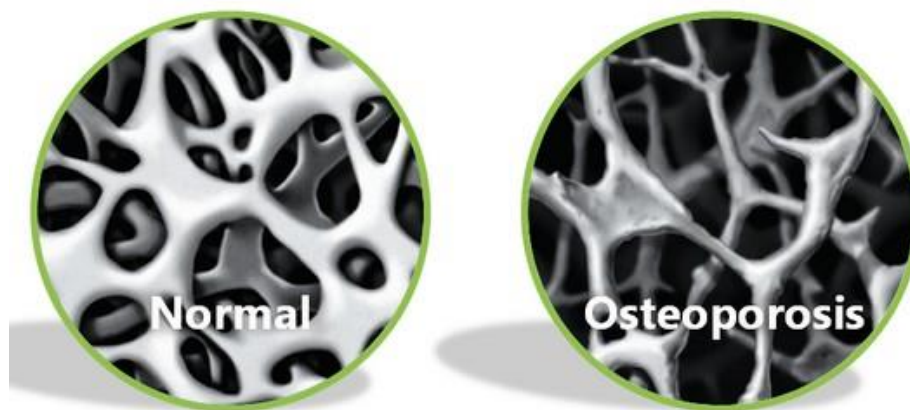**Figure (1):** Showing difference between normal bones and osteoporotic bones. One can see thinning of connecting bone and big spaces in the bone structure making the bone more fragile.

Osteoporosis is determined as "the quiet thief of the bone", what is associated with its asymptomatic course. This process is extremely complex, often takes place in the course of many years. Even when it comes to the violent and dynamic

resorption within the bone, this will not trigger a feeling of pain, especially in early stages of this process. In consequence, a patient experiences a fracture that happens while performing everyday home activities as the effect of progressed damage to the bone tissue. In the course of osteoporosis, the so-called low-energy fracture or fragility fracture is essential, that is the fracture caused by a minor trauma, for instance fall from the height of the body or hitting a table with a hand *(Wawrzyniak, 2013).*

This disease is a major public health problem throughout the world. Elderly people are the fastest growing populations in the world and, as people age, bone mass declines and the risk of fractures increases *(Lane, 2006).*

Osteoporosis classification:

Osteoporosis has been divided into several classifications according to etiology and localization in the skeleton. Osteoporosis is initially divided into localized and generalized categories. These two main categories are classified further into primary and secondary osteoporosis *(Khosla et al., 2008).*

The disease is classified as primary type1, primary type2, or secondary osteoporosis. The form of osteoporosis most common in women after menopause is referred to as primary type1 or post-menopausal osteoporosis. Primary type 2 osteoporosis or senile osteoporosis occurs after age of 75 years

and is seen in both females and males at a ratio of 2:1. Finally, secondary osteoporosis may arise at any age and affect men and women equally. This form results from chronic predisposing medical problems or disease, or prolonged use of medications such as glucocorticoid. Oral anticoagulant or anticonvulsant *(Khosla et al., 2008).*

Variations in the alimentary and endocrine systems in both women and men have a fundamental role in the development of osteoporosis: if these variations are combined with an inappropriate life style (e.g., inadequate physical exercise, alcohol abuse or smoking), pathologies such as hyperparathyroidism, thyrotoxicosis and the use of drugs such as antipsychotics or corticosteroids, the risk of osteoporosis is increased *(Lanzini et al., 2006).*

Epidemiology:

It is a common disease affecting 200 million women worldwide. The National Osteoporosis Foundation (NOF) updated prevalence data estimating that a total of 54 million U.S adults age 50 and older are affected by osteoporosis and low bone mass. Osteoporosis causes more than 8.9 million fractures annually, resulting in an osteoporotic fracture every 3 seconds.

Approximately one tenth of women aged 60, one fifth of women aged 70, two fifths of women aged 80 and two thirds of women aged 90 have osteoporosis.

In Egypt, calculation shows that 53.9% of post-menopausal women have osteopenia and 28.4% have osteoporosis. As 26% of men have osteopenia and 21.9% have osteoporosis *(National Osteoporosis Foundation, 2014).*

Osteoporosis Significance:

The World Health Organization classified osteoporosis as the 10th most important disease associated with the progress of civilization in the contemporary world *(Kanis et al., 2012).*

It is an illness, for which the incidence increases with age. Osteoporosis regards the entire population in different periods of life; however women in the post-menopausal age and the elderly (over 70 years old) appear to be the most exposed to its development. The risk of falling ill, concerning women is growing proportionally to the age and doubles every decade after 65 years of age. It is estimated that worldwide osteoporosis affects 200 million women, from whom about 20-25% will sustain an injury in the form of a bone fracture *(Seweryenk et al., 2013).*

Osteoporotic fractures constitute a serious problem, both for the public health and health care system. The consequences of osteoporotic fractures encompass an increased percentage of disabled people in an aging society. It is a major public health problem worldwide because of the associated morbidity, mortality and costs. The financial burden of osteoporotic