

Understanding
Osteoporosis

Professor Juliet E. Compston

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IMPORTANT NOTICE

This book is intended not as a substitute for personal medical advice but as a supplement to that advice for the patient who wishes to understand more about his or her condition.

Before taking any form of treatment
YOU SHOULD ALWAYS CONSULT YOUR MEDICAL
PRACTITIONER.

In particular (without limit) you should note that advances in medical science occur rapidly and some information about drugs and treatment contained in this booklet may very soon be out of date.

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Introduction

What is osteoporosis?

We are all familiar with the frailty, fractures, curved back and loss of height that are often regarded as a normal part of ageing. In fact, these are symptoms of a disease, osteoporosis, which can be prevented if steps are taken earlier in life. If allowed to progress without treatment, osteoporosis is one of the leading causes of suffering, disability and death in elderly people. Fortunately, there is now increasing awareness of osteoporosis, among both doctors and the public, and there have been important breakthroughs in its diagnosis and treatment.

Osteoporosis means porosity or thinning of the bones, whatever the cause, and is present in most very elderly people. Bone loss with ageing is a universal phenomenon but becomes a disease when bone mass falls to a level at which fracture (breaking of a bone) is likely to occur.

In normal young adults the bones are strong and break only when there is severe trauma (great external force), for example, in a car accident. With ageing and with certain diseases, the bones become thinner and, as a result, weaker so that they break much more easily. These fragility fractures are the hallmark of osteoporosis and are particularly common in the wrist, spine and hip.

How common is osteoporosis?

The risk of having a fracture as a result of osteoporosis rises steeply with age. At the age of 80 years, one woman in three (33 per cent) and one man in five (20 per cent) can expect to have a hip fracture and a similar proportion will have spinal fractures.

At the age of 50 years, a woman has a 40 per cent chance of having a fracture caused by osteoporosis during the rest of her life; the corresponding risk for a man is around 13 per cent.

In the United Kingdom every year, there are about 250,000 fractures resulting from osteoporosis, of which 60,000 occur in the hip and 50,000 in the wrist.

Although most common in elderly women, osteoporosis can also affect men and may occur at any age from childhood onwards. The frequency of osteoporosis varies widely in different parts of the world, being particularly common in western Europe and the USA, and affecting white and Asian people more than black people.

As people all over the world are living longer, the number of elderly people in the population will increase dramatically over the next 50 years and this will probably lead to a doubling or more in the number of fractures resulting from osteoporosis.

The consequences of osteoporosis

The suffering and disability caused by fractures resulting from osteoporosis have created a major health problem in many elderly populations throughout the western world; osteoporotic fractures are also an important cause of death in elderly people and 15–20 per cent of people who suffer hip fractures die within six months. The costs to our health services resulting from osteoporosis are enormous.

It has been estimated that we spend just over £2.1 billion each year treating patients with fractures resulting from osteoporosis and these costs are likely to rise steeply as the numbers of elderly people increase.

Case studies

Fred: illness-related osteoporosis

Fred developed Crohn's disease, an inflammation of the bowel, when he was 16 and he required several operations to remove diseased intestine; he also needed steroid treatment. He presented with severe back pain at the age of 22, and an X-ray showed that the bones were thin and one of the bones in the spine (a vertebra) was crushed. A diagnosis of osteoporosis was made and he was given treatment to reduce the pain and to prevent further bone loss. In this case, osteoporosis was the result of a combination of steroids and reduced absorption of nutrients from the diseased bowel.

Mary: postmenopausal osteoporosis

Mary was aged 56 years when she fractured her wrist. She had been well up to that time and had not experienced any previous fractures. The wrist fracture occurred when she tripped while out shopping and fell onto her outstretched hand. She was seen in the accident and emergency department of a local hospital and a plaster was applied to the arm. She was seen a few weeks later by an orthopaedic surgeon to check that the fracture was healing and referred to another department to have a bone density measurement made. The results of this showed that she had osteoporosis and she was advised to start medication to reduce her risk of further fractures. In this case, no predisposing causes for osteoporosis were found and a diagnosis of postmenopausal osteoporosis was made.

Cynthia: premature osteoporosis

Cynthia, aged 70, went to see her doctor because she noticed that she had lost several inches in height over the past year. She had also noticed that her spine had become rounded and that she had lost her figure – her abdomen seemed to have become much rounder and she had lost her waistline. Daily activities, such as housework and shopping, had become increasingly difficult as her back became very uncomfortable after standing for prolonged periods. Although she had generally been healthy in the past, she had experienced an early menopause at the age of 41 years, but she was not advised to take hormone replacement therapy at that time. X-rays showed osteoporosis of the spine. She was treated with physiotherapy and given medication to prevent any further bone loss. In this case, premature menopause is likely to have been a major factor in the development of severe spinal osteoporosis.

KEY POINTS

- Osteoporosis is the result of thinning of the bones, causing them to break more easily than normal
- Although most common in elderly women, osteoporosis also affects men and may occur at any age
- By the age of 80 years, one woman in three and one man in five can expect to have a fracture as a result of osteoporosis

How does osteoporosis develop?

Normal bone structure

Normal bones are composed of a shell of compact or solid bone surrounding connecting plates and rods of bone (spongy bone) within which lies the bone marrow. The thickness of the outer shell of compact bone varies in different parts of the skeleton; for example, it is much greater in the skull and bones of the legs and arms than in the spine. Much of the strength of the skeleton is the result of compact bone but the spongy bone also makes an important contribution. Bone is actually made up mainly of a protein called collagen and bone mineral, which contains calcium.

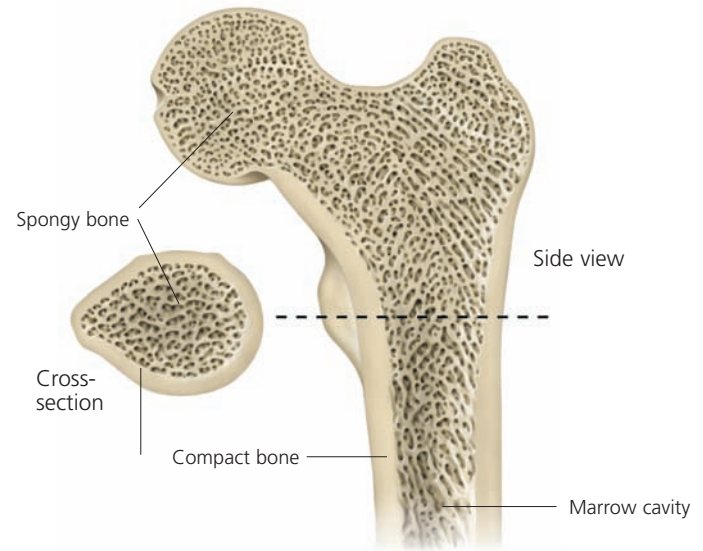
Bone is alive

Bone is a living tissue which needs to be constantly renewed to keep up its strength. All the time old bone is being broken down and replaced by new stronger bone. If this process, which takes place on the bone

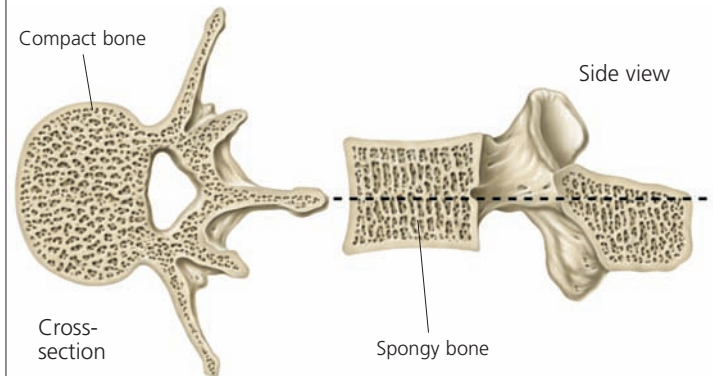
Normal bone

Bones provide shape and support for our bodies. They also serve as storage sites for minerals and blood cells are formed within the marrow.

1. Side view and cross-section of bone (femur)



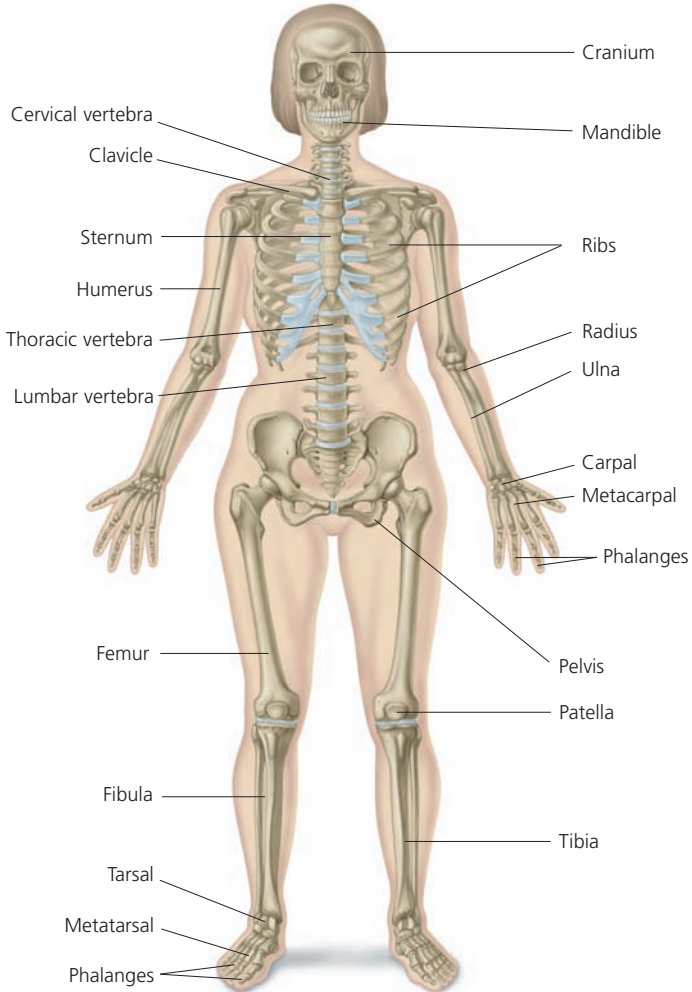
2. Side view and cross-section of typical vertebra



The human skeleton

There are about 206 bones in the human skeleton linked to each other by joints. They provide a strong flexible framework that is moved by muscles.

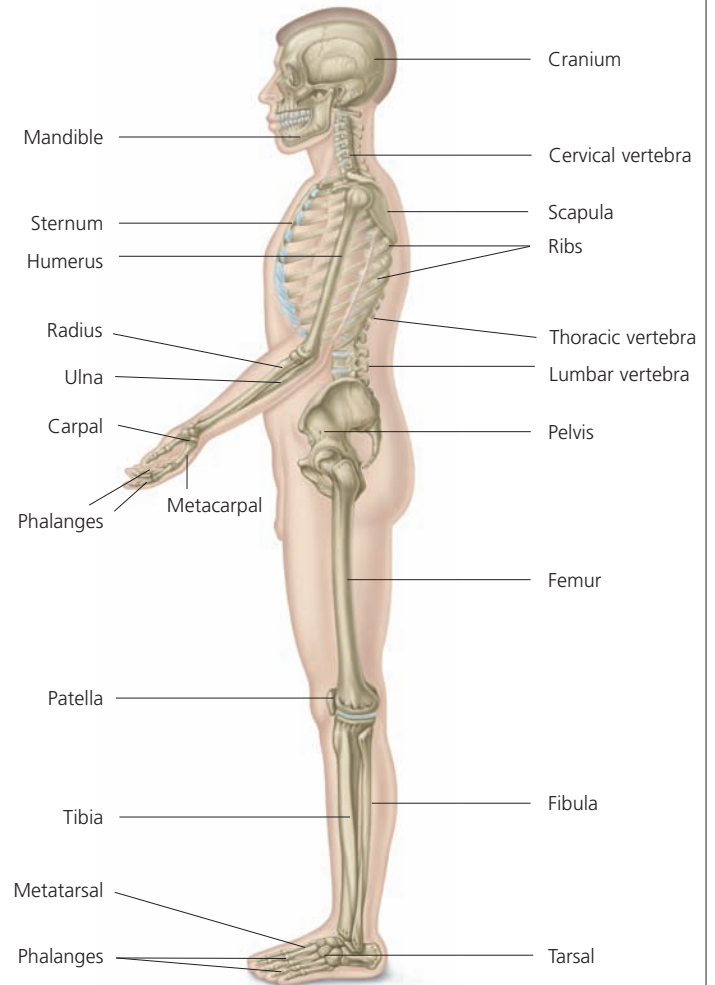
Front view of skeleton



The human skeleton (contd)

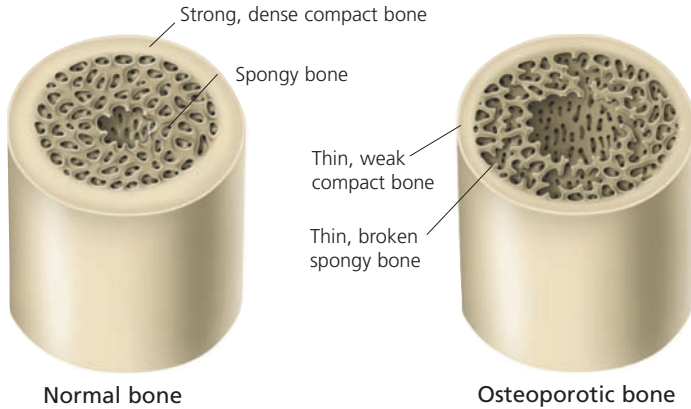
Some bones also surround and protect internal organs such as the lungs and brain.

Side view of skeleton



How osteoporosis changes bone structure

Bone consists of an outer layer (called the periosteum) of dense compact bone and a layer of spongy bone. In osteoporosis the two inner layers become much thinner, weakening the bone and greatly increasing the likelihood of fracture.



surface and is called bone remodelling, did not exist our skeleton would begin to suffer from fatigue damage while we were still young! There are two main types of cell in bone: the osteoclasts which destroy bone and the osteoblasts which make new bone. Both of these are formed in the bone marrow.

As we get older the osteoclasts become more active and the osteoblasts less active, so more bone is removed and less formed.

Changes in bone in osteoporosis

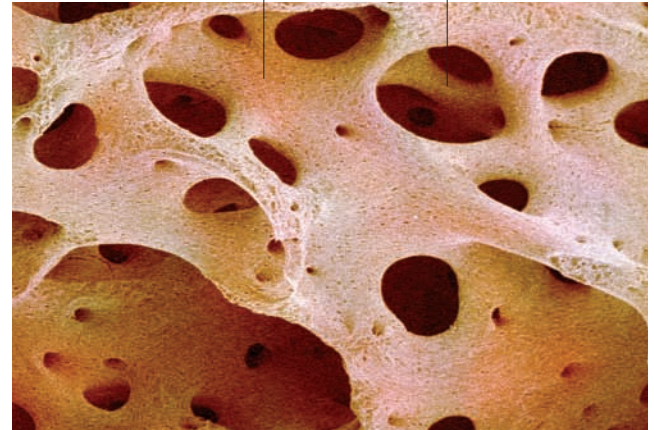
In osteoporosis, the amount of both compact and spongy bone is reduced. Thinning of the outer layer of compact bone greatly reduces its strength and increases the likelihood of fracture. As bone loss occurs

The change from healthy to osteoporotic bone

Normal spongy bone tissue

Strong calcium-rich bone

Spaces between bony material are filled with marrow in living bone



Osteoporotic spongy bone tissue

Bone mass is lost

Fragile, brittle bone material

