

## DYSBARIC OSTEONECROSIS

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### AETIOLOGY

It has been assumed that all types of decompression sickness are due to the formation of bubbles of nitrogen during decompression and that more efficient decompression would prevent this. These assumptions are being questioned and alternative theories of the pathogenesis of decompression sickness are being put forward, but at present no convincing and coherent explanation of all these phenomena of decompression sickness has been constructed. Effect on serum enzymes and coagulation factors may be significant.

The earliest radiographic features are areas of increased density adjacent to the articular surface and these result from new bone laid on dead trabeculae resulting in an overall increase in bone bulk. These develop about eight months to a year after initial exposure to a hyperbaric environment and may be seen within four months. These lesions may remain static or progress to a structural failure of the joint surface and then to secondary osteoarthritis. A lesion of the shaft causes no symptoms or disability.

The diagnosis of dysbaric osteonecrosis is not usually difficult but all other causes of aseptic necrosis of bone must be kept in mind. The most important ones to be excluded are those following fracture of the femoral neck or dislocation of the hip, the idiopathic form sometimes associated with large doses of steroids, the haemoglobinopathies, Gaucher's diseases and Schandler's disease.

Revascularization of both medullary and juxtaarticular lesions may begin but halt short of completion, the revascularization front becoming collagenous. Bone trabeculae adjacent to this fibrous tissue are often greatly thickened and may give rise to a sclerotic line on clinical radiographs. When such a radio-dense line is seen traversing a bone and it is highly probable that the tissue between it and the joint surface is often followed by formation of osteophytes at the living joint margins. At first the joint space remains normal and the articular cartilage covering dead bone is relatively well preserved but later it and underlying dead bone may be ground away, the end result sometimes being difficult to distinguish from primary osteoarthritis. A similar pattern of events and morphological changes may be seen following juxtaarticular bone necrosis due to other causes.

REFERENCE: *J. Clin. Path.* 25: 1004-1006

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### A RAN Diving Achievement

A team of nine divers from HMAS Curlew recently took it in 45 minute duties to march back and forth along a 200m length of rope underwater off Balmoral Beach, Sydney. They required 9 kg lead shoes and 13 kg lead weight belts so were, as a spokesman said, pretty tired when they finished. The aim had been to achieve 40 km in 32 hours but in fact they did 72 km. As the team supervisor said afterwards, "We are very pleased with the distance. Civilians would find that very hard to beat."

Some people hope that nobody is going to try.

Investigation during and after construction of the Type Road Tunnel (1962-66)  
Report of Decompression Sickness Panel, Medical Research Council (British Journal  
of Industrial Medicine 28: 1-21, 1971)

INCIDENCE

15/124 developed definite lesions  
7/124 suspected lesions  
10 had 1 definite lesion  
1 had six lesions  
4 required operative treatment  
First definite lesion nine months after starting work in compressed air  
Not earlier than 4 months  
Definite or suspected lesions:

LOCATION

Upper end of femur	14
Lower end of femur	30
Both ends involved	3

Since the Clyde Tunnel experience of 1963, all compressed air workers in the United Kingdom have had a radiographic skeletal survey and the MRC Decompression Sickness Registry has examined 1694 men showing an incidence of 19.7% with definite osteonecrosis and 11% with a juxta-articular lesion.

RADIOLOGICAL REQUIREMENT OF THE VICTORIAN MINING ACT

All persons working in or entering compressed air shall have an X-ray of the chest at intervals of not more than 12 months.

All persons working in or entering compressed air where the gauge pressure is over 13 psi shall have an X-ray of the heads of the long bones to detect bone necrosis not later than six months after first commencing work in or entering such compressed air and at intervals of not more than six months thereafter.

SKELETAL SURVEYS PERFORMED FOR THE BOARD OF WORKS

First record of Skeletal Surveys, January, 1969.

Number of examinations up to and including 23 July 1975 = 608

(This is the number of patients not all of whom were subsequently employed in compressed air)

X-rayed 6 or 12 monthly depending on the pressure - 28 ppsi lowest and 38 ppsi upper limit to date.

Full size chest X-ray initially, Micro each 12 months.

One case of bone necrosis. Many disc degenerations and spondylolisthesis. Workers are no longer excluded because of bond islands at initial examination.

## History of patient

(whose films were demonstrated by courtesy of Mr Leo Lenaghan)

6 October 1970	No previous experience. X-rays NAD.
16 April 1971	860 hours at 14 psi
24 February 1972	1150 hours at 29 psi
29 January 1974	851 hours at 38 psi. No symptoms.
23 May 1974	Evidence of aseptic necrosis. X-ray appearances unaltered but has pain. Continued employment out of pressure. Ultimately total hip replacement. Films demonstrated

The patient had been a professional diver for 30 years. His usual depth of operation was about 50 feet below the surface. However, whilst he was working in the Eildon Dam in 1953 and at a depth of 200 feet the hose broke and he had to surface quickly. He then went down again to a depth of 200 feet and said that after this episode he suffered from an attack of the bends. He said that after this episode he suffered from an attack of the bends. He said that he was semi-conscious for a period of four to five days. He had cramping pain in his arms and legs. After this episode in 1953 he had no special treatment, just went home and was off work for some weeks. He said that he had had no trouble with his hips and shoulders prior to this incident but after this incident in 1953, he used to get some pain in the shoulders and in the legs and, in particular, in the right leg. He said his right leg used to go weak on him.

He then described another episode of bends in 1970. At this time he was working on the sunken ferry, the "Wahini" and it was at that time that he was taken to Auckland to the naval establishment and was recompressed in a chamber for a period of sixteen hours. He was then flown back to his previous place of work and continued on working.

The patient is now aged 57 years and is working as a taxitruck driver.

Clinically, the patient is a person of slender build and is rather tough and wirey. He had a considerable reduction of movement in both shoulders and both hips and pain in all four joints. He also had a considerable amount of coxa vara deformity in his right hip. He also had some arthritis in both knees but only of a minor nature. I could not find any evidence of arthritis in other joints.