Hyperbaric Oxygen Therapy In Patients With Dysbaric Osteonectrosis

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Abstract

Dysbaric osteonecrosis (DON) is a type of avascular bone necrosis seen in divers and pressure environmental employees. Early diagnosis is particularly important in DON. The lesions can be detected by bone scintigraphy, magnetic resonance imaging (MRI), or by direct radiography. Hyperbaric oxygen therapy has been used to treat successfully in the early stages of avascular necrosis. Early results of hyperbaric oxygen therapy (HBOT) showed positive results in the treatment of the DON. In this study, there are three patients with dysbaric osteonecrosis who had positive results with hyperbaric oxygen therapy.

Keywords: *Dysbaric Osteonecrosis, Hyperbaric Oxygen Therapy, Decompression, Avascular Bone Necrosis.*

Dysbaric osteonecrosis (DON) is a type of avascular bone necrosis seen in divers and pressurized media workers (Uguen, 2015: 363-7). Opinions are suggested that DON occurs during the decompression phase of diving and is a late manifestation of decompression sickness. The most emphasized theory of the mechanism is that nitrogen bubbles formed in the fatty bone marrow during rapid decompression increase intramedullary pressure and cause ischemia by compression of osteovascular structures. Oxygen toxicity is another possible cause of DON. High oxygen pressures have been shown to cause ischemia by the local vasospastic reaction. On the contrary, considering low DON rates in those who perform oxygen decompression techniques, this oxygen toxicity does not seem to be a possible cause of DON (Edmonds, 2016: 245-246). DON prevalence varies greatly between studies. Toklu et al. found the prevalence in Turkish sponge divers to be 70.6% (Toklu, 2001: 83-8). Dysbaric osteonecrosis is rare in who compressed air breathing at depths of less than 50 meters and recreational scuba divers who follow decompression tables (Edmonds, 2016: 245-246). Clinically, femoral and humeral heads are most frequently affected (Hutter, 2000: 585-90). No theory of embolism can yet explain why other tissues are not embolized or why the humeral head and femoral head are particularly affected. It has been shown that positive results have been obtained with hyperbaric oxygen therapy (HBOT) in the early period of treatment of DON (Aktaş, 2005: 208-220).

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Cases: In the Department of Underwater and Hyperbaric Medicine, Istanbul University, Faculty of Medicine, 3 divers who were followed up and treated with the diagnosis of DON are presented.

Case-1: A 52-year-old male sea harvester without a known chronic illness had a 3-week break from the dive after the decompression sickness, which was completely cured by HBOT. On the first day after the break, the diver performed 2 dives with a total duration of 50 minutes to 35 meters depth with a surface interval of 4 hours and the pain on the right arm and right shoulder started the next day. There was no pathological finding on the direct radiographs of the diver, whose complaint continued for 2 weeks, but osteonecrosis was detected in the right humerus head and neck in the magnetic resonance imaging (MRI) (Figure 1). HBO treatment was initiated, and the pain completely disappeared after 20 sessions of HBOT, and the diver was discharged at his own request.

Case-2: A 33-year-old male diver with no known chronic disease, who has been diving for about 9 years, has had pain in the right hip after a dive 4 years ago and passed spontaneously after a few days. In the anamnesis of the diver who applied to our outpatient clinic, he performed three dives 4 months before. Profile of those dives were at 30 meters depth with 2 hours surface interval and total dive time 60 mins, 50 mins, 30 mins respectively. The diver, who stated that he spent intense effort when he was underwater, then he complained of severe pain in the right hip when surfaced. HBOT was initiated to the diver whose osteonecrosis was detected in the right femoral head in MRI (Figure 2). The diver was discharged on the 20th session of HBOT after the pain subsided and edema regressed in the control MRI.

Case-3: A 37-year-old male diver with no known chronic diseases has been a commercial diver for 5 years. In the last 2 years, he has been performing an average of 2-3 dives per day with a total dive time of about 2 hours at a depth of 25-30 meters. The diver started complaining of pain in his right shoulder 1 month before his admission to the outpatient clinic, and he was hospitalized in our clinic for HBOT, after a compatible appearance with osteonecrosis in the right shoulder region in MRI (Figure 3). After 20 sessions of HBOT, the diver, whose pain in the right shoulder regressed, was discharged.

Discussion / Conclusion: Dysbaric osteonecrosis is a form of avascular necrosis that can be seen after exposure to hyperbaric changes. Early lesions are generally completely asymptomatic and can currently be detected only by bone scintigraphy, magnetic resonance imaging (MRI), or direct radiography. Early diagnosis in DON is particularly important, therefore radiological examination is required if exists decompression sickness in the past or a joint complaint in compressed air workers. While it can be diagnosed earlier by MRI, however, it is that lesions likely will show on the x-ray after months (Hutter, 2000: 585-90). There are two main regions classified as juxta-articular lesions (A lesions) and head, neck, and shaft lesions (B lesions) with the prognostic effects of radiological lesions (Edmonds, 2016: 245-246). It is not yet clear what to

do when asymptomatic B lesions are seen. If the diver has a lesion despite its compliance with decompression tables, it is assumed to be particularly susceptible to DON and it is believed that diving should be restricted to reduce the occurrence of other lesions. It is recommended to avoid the depths that should make decompression stops, avoid helium or experimental dives. If a juxta-articular lesion is present, it is recommended to stop exposure to compressed air, however, no evidence that these lesions have changed their next course (Edmonds, 2016: 245-246).

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FIGURES

Figure 1

Figure 2

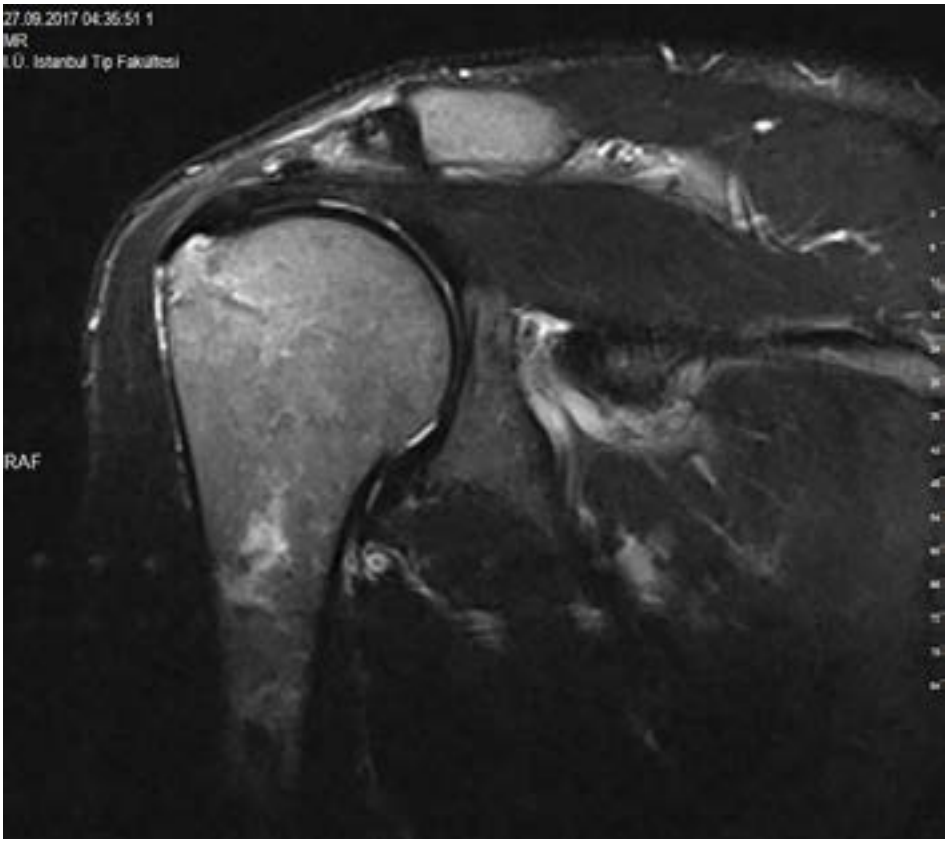

Figure 3