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A Case of Cerebral Arterial Gas Embolism after SCUBA Diving

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Pulmonary barotrauma during ascent is a common complication in SCUBA diving. One of the most severe forms of pulmonary barotrauma is a cerebral arterial gas embolism (CAGE). It is reported to account for about 30% of diving related deaths. The early recognition of CAGE is very important for the emergency physician because prompt hyperbaric recompression therapy can improve the clinical course. Thus, the emergency physician should know the clinical manifestation of CAGE to apply several treatment modalities early. We report a case of cerebral arterial gas embolism presented with hemiparesis and blurred vision immediately after SCUBA diving at 13 meters.

Key Words: Cerebral arterial, Gas embolism, Barotrauma, Therapy

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가 .
가 ,
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가
가 (dysbarism) .
(barotrauma)
가
(squeeze)
가
가 가
가 가
가
(cerebral arterial gas embolism, CAGE)
CAGE
30%
가
가
가
가
가

(SCUBA: Self-Contained Underwater Breathing Apparatus)

640
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29 가 12
12
13 가 2
4
가 1
11 3

110/60 mmHg, 82 ,
 20 , 36.2
 grade 12
 23,600/mm³, 16.5
 g/dl, 37.7%, 322,000/mm³,
 414.2 mg/dl, D-dimer 1.15 mg/dl

bullae가 (Fig. 1)



Fig. 1. Chest PA shows large bullae in the right upper lung field (arrows).

bullae가
 CAGE 가
 가
 (Fig. 2).

가
 13
 . 3
 grade V

CAGE 가 ,
 가
 10
 가
 가
 80 mmHg 1
 가 2).
 (patent foramen ovale,
 PFO)
 30% PFO 가
 3).
 bulla 가 , cyst 4).

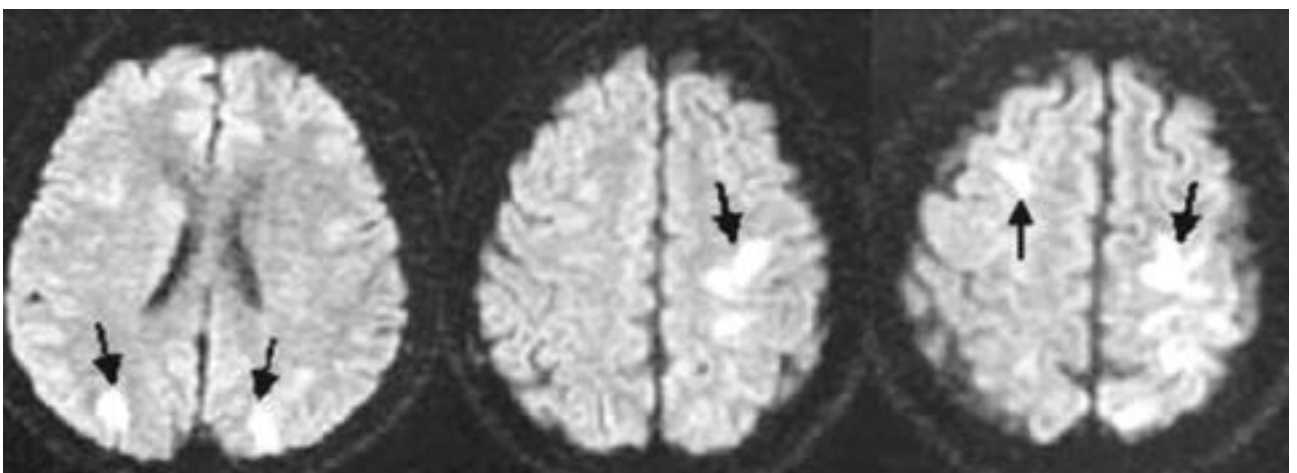


Fig. 2. Diffusion-weighted MRI taken in the emergency department shows multifocal lesions with high signal intensity (arrows) suggesting infarction, in the occipital, parietal and frontal lobes.

(decompression sickness) (Fig. 2)

CAGE 가

bullæ가

1 (Bends) 1 가 100% 7).

Trendelenburg 8).

가 가 가 가 가 가 가 가 가

2 가 가 가 가 가 가 가 가

5 가 5 가 5 가

10% 9). 27 가

5). CAGE Table 6).

Decompression illness 가 10).

CAGE가 가 가 가 가 가

Table 1. Differences between arterial gas embolism and decompression sickness

	Arterial gas embolism	Decompression sickness
Dive history	depth and length dependent decompression limits approached Flying after diving diving at altitude	independent of dive profile rapid ascent inexperience out of air
Risk factors	fatigue dehydration fever, hypothermia obesity strenuous activity	obstructive lung disease emphysema mucous plugging patent foramen ovale
Signs and symptoms	progressive onset spinal symptoms predominant unusual fatigue limb weakness or paralysis abdominal pain urinary retention fecal incontinence periarticular joint pain skin marbling vertigo or nystagmus	rapid onset cerebral symptoms predominant loss of consciousness confusion convulsion motor or sensory loss cardiac arrest

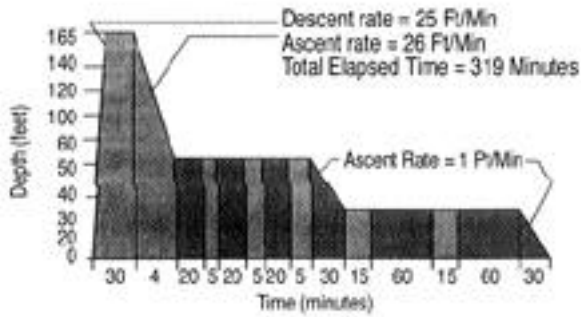


Fig. 3. U.S. Navy Diving Manual, Revision 4.

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balloon

1 5 2 6 , CAGE
6A 6A 100%
5 19

(Fig. 3)^{11,12}.

100%

3 가 30 가 2
30 60 30 30
2 30 12)
2 가 가 2
가
2
가
13 가
가 , bullae 가

가