RESEARCH ARTICLES

Scuba Diving is not Contraindicated in Patients with Hemophilia

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Abstract

Congenital hemophilia often leads to contraindications for some sports. Little is known about the risk of scuba diving in patients with hemophilia. In 2012, we published a report showing that this activity is possible with some restrictions. Here, we report the results of a six-year follow-up of hemophilic patients performing scuba diving. The results from a total of 1,986 dives, including 225 first dives, performed by patients with hemophilia or Willebrand disease showed there to be no bleeding events directly linked to the dive, confirming our previous findings: hemophilia or Willebrand disease are not contraindications for diving, provided the patients respect all the other safety-related constraints and recommendations for scuba diving.

Key Words: hemophilia, hemorrhagic diseases, scuba diving, sports

Introduction

For a long time and in many countries, hemophilia and bleeding disorders have been considered as contraindications to scuba diving. These contraindications were based mostly on fears but were not supported by clinical data.

In 2012, we published an article (1) which questioned this contraindication. The article was based both on theoretical data (2-5), putting in parallel the real risks of scuba diving and the risks associated with hemophilia, and clinical data. We observed that there was no objective reasons to contraindicate scuba diving among hemophiliacs. Two questions could be asked: Could hemophilia be responsible of a diving injury ? Is hemophilia able to worse the consequences of a diving injury? The main diving injuries are ear or pulmonary barotraumatisms, decompression illness, pulmonary edema (2,4,6) and toxic effects of increased partial pressures of gases. There is no reason to suspect hemophilia of being responsible of such injuries. For the second question, one should consider that the main diving incident are not hemorraghic events. Yet, there are situations that can cause hemorrhage when diving including physical trauma, auditory or pulmonary barotrauma and mask squeeze (7-9). Pulmonary oedema is mainly due to barotraumatism which can be prevented by respect of medical contraindication to scuba diving, mainly cardiac underlying disease and by scuba diving in safety conditions. It is generally admitted that almost all scuba diving acccidents can be avoided by following good medical practices. Thus, under strict medical follow-up, and after a careful questionnaire and medical examination to assess that here was no other contraindication to scuba diving, we allowed a number of patients, to dive under the usual conditions of scuba diving but with certain precautions. Twenty patients were studied. They followed a training program including theory ad assessment. In six years, a total of 517 dives were performed, 12 patients made 12-153 dives, whereas 6 made eight dives each. At the end of this first step, our findings confirmed the theoretical data: no incident was noted during or after the dives. This allowed us to suggest to the French Scuba diving authorities (FFESSM: Fédération Française d'Etudes et de Sports Sous-Marins) to modify the French medical guideline for scuba diving. We applied some restrictions – detailed below – so that the patients could stay in safe conditions. This allowed us to extend the observation period with new hemophiliacs. We report here these complementary data.

Patients, materials, and methods.

The conditions included in the French regulations to allow scuba diving of patients with hemorrhagic disease are as follows: age >14 years; regular follow-up in a hemophilia treatment center (HTC) for more than one year before beginning the activity; ability of the person with hemophilia (PWH) to identify the circumstances in which he might be at risk of bleeding; ability of the PWH or person with Willebrand disease to determine the dose of antihemophilic factor to infuse and to infuse himself with the factor or desmopressin; and the PWH must not harbor an inhibitor. These five requirements must be confirmed by a specialist of the HTC and a certificate assessing the absence of contraindications for scuba diving for the PWH is required. The final agreement can only be provided by a medical doctor belonging to the Federal Medical Network of the FFESSM who considers the first certificate given by the HTC specialist and the list of other contraindications for scuba diving drawn up by the FFESSM.

In addition, we specified that the dive must start from the beach or a small craft with a deck,

the weather conditions must not generate instability of the boat, and the diver must have a dose of the usual treatment and the device to infuse it close to the dive's starting point (beach or deck).

Concerning treatment, we considered that a systematic infusion of antihemophilic factor was not necessary before diving.

Finally, patients were informed that in case of an incident or clinical situation that would require treatment, they had to infuse their usual dose.

From July 2004 to July 2018, 27 patients with hemophilia or Willebrand disease performed a total of 1,761 dives (Table 1). The distribution was as follows: 25 Hemophiliacs (24 hemophilia A and one hemophilia B), all severe (> 1%), amongst whom 13 were under prophylaxis and12 received on-demand treatment; two type 1 Willebrand disease. Fifteen patients had moderate to severe hemorrhagic disease-related arthropathy and four had joint prostheses. Additionally, we registered first 225 dives performed mainly for 10 summer camp from 2004 to 2017.

The undesirable events were staged as major or minor bleeding events occurring during a dive, major or minor bleeding event that were linked to the dive, but did not occur during the dive, and other non-bleeding events.

Table 1. Details concerning patients with hemophilia or Willebrand disease who performed scuba diving. HA: hemophilia A; HB: hemophilia B; WD: Willebrand disease; prophylaxis Y/N: regular infusion of antihemophilic factors according to the prophylaxis procedure used in hemophilia treatment; MD: missing data.

Initials	Disease	Type	Prophylaxis	Arthropathy	Prosthesis	Nb of dives	First Dive	Events
MH	HA	severe	Y	N	Y	823		1
NF	HA	severe	N	Y	Y	28		0
BM	HA	severe	Y	Y		14		0
CG	HA	severe	Y	N		17		0
AC	HA	severe	N	Y	Y	83		0
HC	HA	severe	Y	Y		8		0
VM	HA	severe	Y	N		8		0
ML	HA	severe	Y	N		8		0
MD	HA	severe	N	N		8		0
JD	HA	severe	N	Y	Y	25		0
JM	HA	severe	Y	N		49		0
FF	HA	severe	N	Y		14	1	0
GC	HA	severe	N	Y			1	0
SJ	B	severe	N	N		12		0
LV	HA	severe	N	N			2	
SW	HA	severe	Y	N			2	
MZ	WD	Type1	N	N		23	1	1
MZ	WD	Type1	N	N		23	1	
AN	HA	severe	Y	Y		24		
ZB	HA	severe	Y	Y		23		
AS	HA	severe	Y	Y		8		
SE	HA	severe	N	Y		8		
AM	HA	severe	N	N		8		
ZA	HA	severe	N	N		8		
BZ	HA	severe	Y	Y			2	
AJ	HA	severe	Y	Y			2	
BU	HA	severe	N	Y			1	
SC2004	HA/HB/WD	MD	MD	MD			23	0
SC2006	HA/HB/WD	MD	MD	MD			35	0
SC2007	HA/HB/WD	MD	MD	MD			35	0
SC2008	HA/HB/WD	MD	MD	MD			30	0
SC2009	HA/HB/WD	MD	MD	MD			29	0
SC2011	HA/HB/WD	MD	MD	MD			18	0
SC2015	HA/HB/WD	MD	MD	MD		186	18	0
SC2016	HA/HB/WD	MD	MD	MD		224	22	0
SC2017	HA/HB/WD	MD	MD	MD		98	2	0
SC2018	HA/HB/WD	MD	MD	MD		31		
Total					**4**	**1761**	**225**	**2**

Results

Among the 27 candidates who suffered from hemorrhagic disease and wished to dive, none were excluded for the usual contraindications to scuba diving: heart, pulmonary, or ear disease.

A total of 1,986 dives were performed (Table 1). There were two minor incidents, considered to be minor bleeding events, that were linked to the dive but did not occur during the dive: one patient received a cut to the ankle on a rock at the start at the beach, which required compressive treatment; the second received a wound to the hand while on the boat.

There were no accidents directly related to diving: no epistaxis or hemorrhagic signs during the dive or complications related to joint status.

No antihemophilic factor infusion was necessary before or after the dive and no desmopressin was taken before or after the dive.

Discussion

The absence of data concerning scuba diving and hemophilia led us to consider the possibility of allowing this activity for PWH. There are no known interactions between hyperbaric pressure and anticoagulation. Thus, no official text strictly prohibits scuba diving for PWH: hemophilia is considered by both Professional Association of Diving Instructors (PADI) documents and the French Federation medical recommendations to be a relative contraindication for scuba diving. These texts propose evaluating each case individually. Thus, in a preliminary study, we allowed 20 fully informed PWH to perform scuba diving under strict medical supervision. A total of 517 dives were performed over six years. No accident or incident was noted. We thus decided to allow more dives for these patients and to include new patients, with the same requirements and under the same medical supervision. Here, we report these new data. The results of a total of 1,986 dives, including 225 first dives, performed by patients with hemophilia or Willebrand disease showed there to be no bleeding events directly linked to the dives, confirming our previous findings: hemophilia or Willebrand disease are not contraindications to diving, provided the patients meet the criteria that we determined with the French diving authorities (Table 2).

Table 2. The five conditions required for PWH willing to perform scuba diving (Ref.1)

1 Age>14 years
2 Regular follow-up in an HTC for more than 1 year before beginning the activity
3 The PWH must be able to identify the circumstances in which he might be at risk of bleeding
4 The PWH must be able to determine the dose and infuse his antihaemophilic factor or desmopressin itself
5 The PWH must not have an inhibitor

The specific requirements for diving with hemophilia must be validated by a doctor of the HTC where the patient is followed for at least one year. Then, a doctor aware of the medical requirements for scuba diving can deliver the authorization if there is no other contraindication unrelated to hemophilia: heart or chest diseases, epilepsy, or ear diseases (2-4).

Some specific recommendations must be given to the PWH allowed to dive: start the dives either from the beach or a boat, with acceptable weather conditions unlikely to generate instability on the boat.

Although this procedure is somewhat cumbersome, it is necessary to allow PWH to continue diving safely, insofar as they respect all other safety-related constraints and recommendations for scuba diving.

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