



Recreational scuba diving in subjects with heart valve disease : French underwater federation guidelines only applicable in case of asymptomatic valvular disease.

Gérald PHAN (Levallois-Perret), Benoît BROUANT (Creutzwald), Gérard FINET (Bron), Rémy KRAFFT (Metz),
 Vincent LAFAY (Marseille), Frédéric ROCHE (Saint-Etienne), Bruno GRANDJEAN (Ajaccio).
 Cardiologic task force of FFESSM's Medical and Prevention Commission.

Lesion	Evaluation	Criteria for eligibility	Rhythm	Competitive sports	Diving
Mitral Valve Stenosis (MVS) : according to valve opening area:					
Mild Mitral Valve Stenosis	ECG, Echocardiography. In selected cases : Holter, Exercise testing.	Mitral valve area > 1,5 cm ² Resting PSAP < 35 mmHg ⁽²⁾	Sinus rhythm	All sports	Yes
		If anticoagulant treatment : Stable INR between 2 and 3.	Atrial Fibrillation	Low-moderate sports ⁽¹⁾ except those with risk of body collision	PSC
Moderate Mitral Valve Stenosis	ECG, Echocardiography, Holter, Exercise testing. In selected cases : stress-echocardiography testing.	Mitral valve area 1,0 to 1,5 cm ² Resting PSAP < 50 mmHg ⁽²⁾		Low dynamic and static sports ⁽¹⁾	NO or PSC if stress-echo test
Severe Mitral Valve Stenosis		Mitral valve area < 1,0 cm ² Resting PSAP > 50 mmHg ⁽²⁾		Low dynamic and static sports ⁽¹⁾	NO
Mitral Valve Regurgitation (MVR) : according to effective regurgitant orifice area (ERO)					
Mild Mitral Valve Regurgitation	ECG, Echocardiography. In selected cases : Holter, Exercise testing.	ERO < 20 mm ² LV size < 60 mm ⁽²⁾ LVEF ≥ 60 % Resting PSAP < 35 mmHg ⁽²⁾	Sinus rhythm	All sports	Yes
			Atrial Fibrillation	All sports except those with risk of body collision	PSC
Moderate Mitral Valve Regurgitation	ECG, Echocardiography. In selected cases : Holter, Exercise testing, cardiac catheterization.	ERO 20-40 mm ² ⁽¹⁾ LV size < 60 mm ⁽²⁾ , LVEF ≥ 60 % LV > 60 mm ⁽²⁾ or LVEF < 50 %		Low-moderate dynamic and static sports ⁽¹⁾	No or PSC if exercise test
Severe Mitral Valve Regurgitation			ERO > 40 mm ² ⁽¹⁾	No competitive sport	NO
Aortic Valve Stenosis (AVS) : according to Aortic Valve opening area (AVA) and mean aortic valve pressure Gradient (mG).					
Mild Aortic Valve Stenosis	ECG, Echocardiography, Exercise testing	AVA > 1,5cm ² , mG < 20mm Hg ⁽¹⁾		Low-moderate sports.	Yes
Moderate Aortic Valve Stenosis	ECG, Echocardiography. In selected cases : Exercise testing,	AVA 1-1,5 cm ² , mG 21-49 mmHg ⁽¹⁾ AVA < 1 cm ² , mG > 50 mm Hg ⁽¹⁾		Low sports	No or PSC if exercise test
Severe Aortic Valve Stenosis			No competitive sport	NO	
Aortic Valve Regurgitation (AVR) and ascending aorta diseases					
Mild to moderate Aortic Valve Regurgitation	ECG, Echocardiography. In selected cases : Holter, Exercise testing, Invasive tests.	Normal LV size, LVEF ≥ 60 % Normal L.Atrial size LV < 60 to 65 mm ⁽²⁾ LVEF > 50 % Normal LA size LV dilatation or LVEF < 50 % or LA dilatation or asc.aorta > 50 mm	Ventricular arrhythmia	All sports	Yes
Moderate Aortic Valve Regurgitation			No ventricular arrhythmia	No competitive sport ⁽¹⁾	NO
Moderate to severe Aortic Valve Regurgitation			Low sports ⁽¹⁾	No or PSC if exercise test	
Dilatation of the ascending aorta	Echography, in selected cases CTscan or MRI	Ascending aorta < 50 mm < 40 mm if bicuspid aortic valve		All sports	Yes
Marfan's syndrome with or without AVR⁽²⁾	Echography every 6 months	Asc.aorta < 40 mm, No MVR No family history of dissection or SD		Low-moderate dynamic and low static sports ⁽²⁾	PSC
Tricuspid Valve Regurgitation (TVR) : Diving is forbidden for all diseases with pulmonary hypertension.					
Organic Tricuspid Valve Regurgitation	ECG, Echocardiography, exercise testing.	Right atrial pressure < 20 mm Hg Normal RV systolic pressure		All sports	Yes
After valve surgery or valvuloplasty (post-operative delay of at least 6 to 12 months).					
Valve repair or bioprosthetic valve without anticoagulant treatment	ECG, Echocardiography.	Mild valve regurgitation or normal prosthetic valve function Normal LV function	Sinus rhythm	Low-moderate sports	Yes
Valve repair or bioprosthetic valve or low thrombotic risk mechanical aortic valve with anticoagulant treatment	ECG, Echocardiography.	Mild valve regurgitation or normal prosthetic valve function Normal LV function Stable INR between 2 and 3.	Sinus rhythm	Low-moderate sports except those with risk of body collision	Yes
			Atrial Fibrillation		
Mechanical prosthetic valve needing INR > 3	ECG, Echocardiography.	Normal prosthetic valve function Normal LV function		Low-moderate sports except those with risk of body collision	NO or PSC if INR particular caution

(1) Mellwig KP, van Buuren F, Gohlke-Baerwolf C, Bjornstad HH. Recommendations for the management of individuals with acquired valvular heart diseases who are involved in leisure-time physical activities or competitive sports. Eur J Cardiovasc Prev Rehabil 2008;15: 95-103.

(2) Bonow RO, Cheitlin MD, Crawford MH, Douglas PS. Task force 3 : Valvular Heart Disease. 36th Bethesda conference, Eligibility recommendations for competitive athletes with cardiovascular abnormalities. J Am Coll Cardiol. 2005, vol 45 (8) : 1334-1339.

Diving may be considered exclusively in asymptomatic patients :
Yes = Scuba diving participation can be allowed if all eligibility criteria are met.
PSC = Personalised Specific Conditions must be assessed on an individual basis
NO = Contraindication is definite for diving.