SUPPLEMENTARY MATERIAL

PET/MRI acquisition

On average, the PET/MRI scan was started 96±27 min after injection of 358±58 MBq [18F]FDG. The scans covered the region from the top of the skull to at least the upper legs. A whole-body contrast-enhanced magnetic resonance angiography (CE-MRA) was performed after contrast agent (Magnograf®) administration to judge the lumen of the aorta and the major branches and to identify potential stenosis, occlusions or aneurysms. Axial fat-suppressed volumetric interpolated breath-hold examination (VIBE) T1-weighted (T1w) sequences after contrast media application were performed to investigate the volume, extent and contrast enhancement of RF. In addition, coronal T2-weighted (T2w) short τ inversion recovery (STIR) was acquired to evaluate the presence of potential oedema in RF.

Supplementary Table I. Potential etiology / association, immunological parameters and serum IgG4 levels together with data on therapy and follow-up.

No	Sex	Age	Potential etiolgoy / association	ANA (IFT titer)	ANCA (IFT titer)	IgG4 (mg/dl)	Therapy	Follow-up (months)
1	m	57	asbest exposition 20 years before diagnosis	<1:120 ^{D}	<1:8 ^{D}	29.6 ^{C}	previous	145
2*	m	75	IgG4-related disease	---	---	171.0 ^{D}	no	25
3*	m	56	none	---	---	123.0 ^{D}	no	25
4	f	59	none	1:120 ^{D}	<1:8 ^{D}	68.1 ^{D}	previous	480
5*	f	54	none	---	---	82.2 ^{D}	no	23
6*	m	57	none	---	---	7.8 ^{C}	current	23
7	f	82	none	1:240 ^{D}	<1:8 ^{D}	29.1 ^{C}	previous	149
8	m	61	none	<1:120 ^{D}	<1:8 ^{D}	103.0 ^{C}	previous	128
9*	f	70	none	---	---	59.0 ^{D}	no	17
10	m	54	seminoma, orchiectomy 14 years before diagnosis	<1:120 ^{D}	---	42.2 ^{D}	previous	59
11	m	76	none	<1:120 ^{C}	<1:8 ^{D}	41.4 ^{C}	previous	115
12	f	64	none	<1:120 ^{C}	---	18.6 ^{C}	current	47
13*	m	46	pancreatitis due to chronic alcohol abuse; pseudocyst and concrement, pancreatico-jejunostomy	<1:120 ^{C}	<1:8 ^{D}	3.7 ^{D}	no	16
14*	f	52	none	<1:120 ^{C}	<1:8 ^{C}	70.7 ^{D}	no	22

*patients with first diagnosis of retroperitoneal fibrosis at the time of examination. D superscript: value at the time of diagnosis; C superscript: value during disease course. ---: missing data. Diagnosis confirmed by biopsy in patients 1, 8 and 11. In patient 2 diagnosis of IgG4-related disease confirmed by biopsy of left lacrimal gland; follow-up from diagnosis to last visit.
Normal range: ESR ≤ 20 mm; CrP ≤ 0.5 mg/dl; ANA <1:120; ANCA <1:8; IgG4 10 - 140 mg/dl.
m: male; f: female; ANA: antinuclear antibodies; IFT: immunofluorescence; ANCA: antineutrophil cytoplasmatic antibodies; IgG4: immunoglobulin G4.

Supplementary Table II. Correlation between PET/MRI parameters and disease activity scenarios and inflammatory parameters respectively.

	Disease activity scenarios			Inflammatory parameters	
PET/MRI results	S1	S2	S3	CRP	ESR
SUV max	p=0,138*	p=0,207*	p=0,119*	r=0,481 / p=0,051 •	r=0,164 / p=0,542 •
TBR	p=0,234*	p=0,096*	p=0,073*	r=0,579 / p=0,017 •	r=0,262 / p=0,324 •
Volume	p=0,159*	p=0,091*	p=0,287*	r=0,3667 / p=0,162 •	r=0,192 / p=0,491 •
Visual score	p=0,221*	p=0,227*	p=0,344*	p=0,1079 ••	p=0,7639 ••
PET/MRI DAS	p=1,000**	p=0,584**	p=0,219**	-	-

PET/MRI DAS: disease activity status determined by PET/MRI; S1: disease activity based on clinical grounds; S2: disease activity based on inflammatory parameters; S3: disease activity based on S1 and/or S2; visual score: visual four point score in PET; volume: volume of retroperitoneal mass. Statistical testing by Mann Whitney U test *: Fisher's exact test **: Spearmans rank correlation coefficient • and Jonckheere-Terpstra trend test ••. A *p* value <0.05 was considered statistically significant.