

**Supplementary Table S1. List of reagents**

Antibody*	Manufacturer	Catalogue Number	Isotype
BMP7	Santa Cruz Biotechnology	sc-53917	Mouse monoclonal IgG1
$\beta$ -actin	Santa Cruz Biotechnology	sc-8432	Mouse monoclonal IgG1
Fibronectin	BD	610077	Mouse monoclonal IgG1
Collagen I $\alpha$	Abcam	Ab138492	Rabbit monoclonal IgG
$\alpha$ -SMA	Sigma-Aldrich	A5228	Mouse monoclonal IgG1
p-SMAD1/5/8	Cell Signaling Technology	13820	Rabbit monoclonal IgG
t-SMAD1/5/8	Cell Signaling Technology	9743	Rabbit polyclonal IgG
p-SMAD2	Cell Signaling Technology	3108	Rabbit monoclonal IgG
t-SMAD2	Cell Signaling Technology	5339	Rabbit monoclonal IgG
p-SMAD3	Cell Signaling Technology	9520	Rabbit monoclonal IgG
t-SMAD3	Cell Signaling Technology	8028	Rabbit monoclonal IgG
p-ERK	Cell Signaling Technology	9101	Rabbit polyclonal IgG
t-ERK,	Cell Signaling Technology	9102	Rabbit polyclonal IgG
p-p38	Cell Signaling Technology	9211	Rabbit polyclonal IgG
t-p38	Cell Signaling Technology	9212	Rabbit polyclonal IgG
TRAF6	Cell Signaling Technology	8028	Rabbit monoclonal IgG
IL-6	Novus Biologicals	NB600-1131	Rabbit polyclonal IgG
IL-8	Abcam	Ab7747	Rabbit polyclonal IgG
ICAM-1	Cell Signaling Technology	4915	Rabbit polyclonal IgG
p-NF $\kappa$ B	Cell Signaling Technology	3031	Rabbit monoclonal IgG
t-NF $\kappa$ B	Cell Signaling Technology	4164	Rabbit monoclonal IgG
p-Akt	Cell Signaling Technology	9271	Rabbit polyclonal IgG
t-Akt	Cell Signaling Technology	9272	Rabbit polyclonal IgG
p-Jnk	Cell Signaling Technology	9251	Rabbit polyclonal IgG
t-Jnk	Cell Signaling Technology	9252	Rabbit polyclonal IgG

Abbreviations: BMP7, bone morphogenic protein 7;  $\alpha$ -SMA,  $\alpha$  smooth muscle actin; p, phosphorylated; t, total; ERK, extracellular signal-regulated kinase; TRAF6; TNF receptor associated factor 6; IL, Interleukin; ICAM-1, intercellular adhesion molecule 1; NF $\kappa$ B, nuclear factor kappa-light-chain-enhancer of activated B; Jnk, c-Jun NH(2)-terminal kinase

\* The antibodies are listed in the order of appearance.

**Supplementary Table S2.** Clinical information of patient samples used in the present in vitro study

Age (years)	Sex	CAS	Duration Of GO (years)	Proptosis R/L (mm)	Surgery performed
<b>GO patients</b>					
31	F	3/7	5	28/26.5	Decompression
45	F	0/7	3	26/26	Decompression
48	F	2/7	2	20/20	Decompression
57	F	4/7	1	17/16	Decompression
65	F	4/7	2	23/23	Decompression
72	F	0/7	1	19/19	Decompression
23	M	3/7	1	24.5/25	Decompression
36	M	0/7	3	25/26	Decompression
42	M	0/7	10	23/22	Decompression
45	M	5/7	1	16/15	Decompression
56	M	2/7	13	22/22	Decompression
63	M	2/7	1	20/24	Decompression
<b>Non-GO control subjects</b>					
59	F	n/a	n/a	n/a	Blepharoplasty UL OU
61	F	n/a	n/a	n/a	Blepharoplasty UL OU
65	F	n/a	n/a	n/a	Blepharoplasty UL OU
74	F	n/a	n/a	n/a	Blepharoplasty LL OU
76	F	n/a	n/a	n/a	Blepharoplasty UL OU
78	F	n/a	n/a	n/a	Blepharoplasty UL OU
35	F	n/a	n/a	n/a	Blepharoplasty UL OU
58	M	n/a	n/a	n/a	Blepharoplasty UL OU
60	M	n/a	n/a	n/a	Blepharoplasty LL OU
45	M	n/a	n/a	n/a	Blepharoplasty UL OU
63	M	n/a	n/a	n/a	Blepharoplasty LL OU
44	M	n/a	n/a	n/a	Blepharoplasty LL OU

Abbreviation: CAS, clinical activity scores; GO, Graves' orbitopathy; R, right eye; L, left eye; F, female; M, male; n/a, not applicable

**Supplementary Table S3. Literature review of targeting BMP7 signaling in various organs**

<b>Organ</b>	<b>Reference</b>	<b>Treatment</b>	<b>Subject</b>	<b>Administration</b>	<b>Outcome</b>
<b>Bone</b>	Zhang et al, 2007 <sup>22</sup>	rhBMP7	Dogs	Viral vector chitosan/collagen implant	Increased bone formation of mandibular defect
	Hunter et al., 2010 <sup>49</sup>	rhBMP7	Human	Intra-articular injection into the knee joint	Limited toxicity in symptomatic knee osteoarthritis
<b>Brown adipose tissue</b>	Boon et al., 2012 <sup>50</sup>	BMP7	Mouse	Subcutaneous osmotic minipump implant	Increased brown adipose fat volume at subthermoneutral temperature
<b>Kidney</b>	Sugimoto et al., 2012 <sup>51</sup>	AA123 (activator (BMP7 mimetic))	Mouse	Intravenous injection via the tail vein	Antifibrotic effects in a mouse model of kidney disease
<b>Heart</b>	Urbina et al, 2017 <sup>52</sup>	BMP7	Mouse	Intravenous injection	Reducing adverse cardiac remodeling in the pericardiac diabetic cardiomyopathy
	Merino et al, 2016 <sup>28</sup>	rhBMP7	Mouse	Subcutaneous osmotic minipump implant	Suppressing left ventricular remodeling
<b>Liver</b>	Chen et al., 2012 <sup>44</sup>	rhBMP7	Mouse	Intraperitoneal injection	Reducing hepato-schistosomiasis-associated fibrosis via antagonism of TGF- $\beta$ signaling

Abbreviation: BMP7, bone morphogenic protein 7; rhBMP7, recombinant bone morphogenic protein 7; TGF- $\beta$ , transforming growth factor- $\beta$