Supplementary information

Table S1. Clinical information and bone marrow samples of patients enrolled in the current study.

	Case 1	**Case 2**	**Case 3**	**Case 4**	**Case 5**	**Case 6**	**Case 7**
Sample code	OP-001	OP-002	OP-003	OP-004	OP-005	OP-006	OP-007
Extraction date	2019.5.16	2019.5.31	2019.7.3	2019.7.25	2019.7.30	2019.9.19	2019.10.8
Pathogen	Pass	pass	pass	pass	HBVs:+	-	Anti-HCV:+
BM vol.	40ml	27ml	40ml	25ml	35ml	-	27.5ml
Extraction site	L. Hip	R. Hip	R. Hip	L. Hip	R. Hip	L. Hip (terminate)	L. Hip
Age	95	79	76	83	73	67	85
Gender	M	F	F	F	F	F	M
Fracture times/site	1 (L)FNF	2 (L)FNF ->(R)ITF	2	1 (L)hip ITF	1	-	1

	Case 8	**Case 9**	**Case 10**	**Case 11**	**Case 12**	**Case 13**	**Case 14**
Sample code	OP-008	OP-009	OP-010	OP-011	OP-012	OP-013	OP-014
Extraction date	2019.10.24	2019.11.8	2019.12.13	2020.2.13	2020.3.30	2020.4.14	2020.4.29
Pathogen	Anti-HCV:+	pass	pass	Anti-HCV:+	pass	pass	pass
BM vol.	27.5ml	~25ml	23ml	~45ml	~25ml	~37.5ml	~35ml
Extraction site	R. Hip	L. Hip	L. Hip	L. Hip	L. Hip	L. Hip	R. Hip
Age	85	56	77	97	90	90	72
Gender	F	F	M	F	M	F	M
Fracture times / site	1	1 (L)FNF	2 (R)ITF -> (L)ITF	1	1	1	1

	Case 15	**Case 16**	**Case 17**	**Case 18**	**Case 19**
Sample code	OP-015	OP-016	OP-017	OP-018	OP-019
Extraction date	2020.5.13	2020.5.19	2020.6.12	2020.6.30	2020.9.15
Pathogen	HBVs:+	Pass	pass	pass	pass
BM vol.	~40ml.	~42ml	~40ml	35ml	~50ml
Extraction site	L. Hip	L. Hip	L. Hip	R. Hip	R. Hip
Age	57	75	89	85	92
Gender	F	F	F	M	F
Fracture times/site	1	1	1	1	1

Table S2. Details of BMSCs collected from patients enrolled in the current study and patients' disease background

Sample	Age (gender)	BMI	Disease history	Pre-surgery Hb	Diagnosis	Surgery	BM collection date	BMD date	BMD (L-spine)	BMD (FN)
OP-001	95 (M)	19.72	L1,L3 compression fx HTN, arrhythemia	13.8	Lt FNF	bipolar	2019.05.16	2019.07.12	+1.9	Rt FN -1.8
OP-002	78 (F)	23.56	Lt FN s/p bipolar (2018.11.29) HTN, s/p thyroidectomy Osteoporosis under denosumab	11.2	Rt ITF	ORIF	2019.05.31	2018.12.26	-3.1	Rt FN -3.1
OP-003	76 (F)	23.11	HTN L-spine s/p	12.1	Rt FNF	bipolar	2019.07.03	-		
OP-004	83 (F)	23.50	DM, HTN, thalassemia Osteoporosis (bonviva)	8.9	Lt ITF	ORIF	2019.07.25	2014.10.20 2020.07.29	-3.7 -4.7	Rt FN -3.1 Rt FN -4.4
OP-009	56 (F)	19.47	Depression, nursing home anemia	9.6	Lt FNF	bipolar	2019.11.06	2019.12.06	-2.5	Rt FN -2.9
OP-010	77 (M)	22.31	Osteoporosis under Bonviva Rt ITF s/p (2018.08.17) Smoking(+)	12.6	Lt ITF	ORIF	2019.12.13	2018.10.24	-0.0	Lt Thip -2.7
OP-014	72 (M)	23.60	HTN, DM L1 wedge deformity Smoking (+)	14.8	Rt ITF	ORIF	2020.04.28	-		
OP-016	75 (F)	20.55	T11 compression fx	9.6	Lt FNF	bipolar	2020.05.18	-		
OP-017	89 (F)	19.65	dementia	13.2	Lt FNF	bipolar	2020.06.12	2020.06.15	-1.8	Rt FN -4.3
OP-018	85 (M)	22.52	T12/L1 compression fx HTN Smoking (-)	12.9	Rt FNF	bipolar	2020.06.29	2020.07.03	0.6	Lt FN -2.4
OP-019	92 (F)	20.44	DM, HTN, Alzheimer dz	10.0	Rt ITF	ORIF	2020.09.14	2020.09.17	-2.4	Lt FN -3.8
THCTB006	21 (M)		Smoking		Rt FSF		2017.01.11			
THCTB008	22 (M)		HCV(+), smoking		Rt FSF		2017.04.08			
T2B-007	24 (M)				Rt FSF		2018.12.20			

Abbreviation: not determined (nd), fixation (fx), hypertension (HTN).

Table S3. Details of BMSCs collected from the young, healthy donors

	Case 1	**Case 2**	**Case 3**
Sample code	THCTB-006	THCTB-008	T2B-007
Extraction date	2017.01.11	2017.04.08	2018.12.20
Pathogen	Pass	pass	pass
BM vol.	40 ml	40 ml	40 ml
Extraction site	R. femur	R. femur	R. femur
Age	21	22	24
Gender	M	M	M
Fracture times / site	1 (R)femur fracture, car accident	1 (R)femur fracture, car accident	1 (R)femur fracture, car accident
Note	Smoking	Smoking	-

Table S4. Details of selected primary antibodies and isotypes for FACS analysis.

Antibody name	**Clone**	**Description**	**Cat no**	**Lot no**	**Brand**
HLA-DR-FITC	G46-6	Mouse IgG2a	555811	1103331	BD Pharmingen
CD14-FITC	M5E2	Mouse IgG2a	555397	0357884	BD Pharmingen
Isotype-FITC	IgG2a	Mouse IgG2ak	555573	1144955	BD Pharmingen
HLA-ABC-FITC	G46-2.6	Mouse IgG1	555552	9105740	BD Pharmingen
CD45-FITC	HI30	Mouse IgG1	555482	1285678	BD Pharmingen
CD19-FITC	HIB19	Mouse IgG1	555412	9308489	BD Pharmingen
CD105-FITC	SN6	Mouse IgG1	MCA1557F	158807	Bio-Rad
Isotype-FITC	MOPC-21	Mouse IgG1	555748	1054855	BD Pharmingen
CD34-PE	581	Mouse IgG1	555822	0128396	BD Pharmingen
CD90-PE conjugated	5E10	Mouse IgG1,kappa	555596	2026304	BD Pharmingen
CD73-PE	AD2	Mouse IgG1,kappa	550257	1075157	BD Pharmingen
Isotype -PE	MOPC-21	Mouse IgG1	555749	8242609	BD Pharmingen

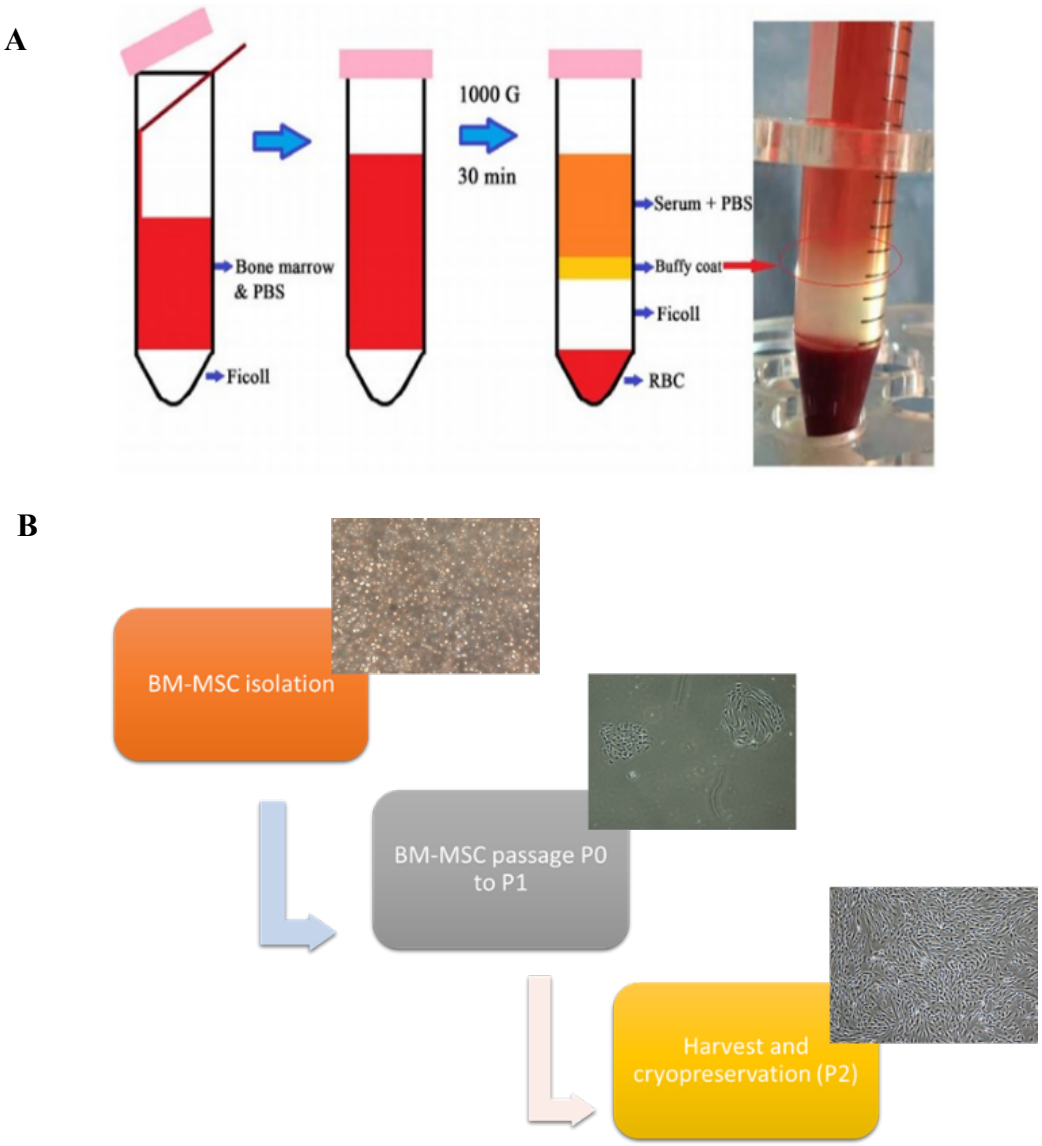

Figure S1. Isolation of bone marrow stem cells by Ficoll gradient centrifugation. **A** Ficoll gradient centrifugation was conducted in 4 °C. **B** Cells in the buffy coat layer were further collected, counted, and plated in the culture dish using α-MEM containing 10% FBS and the P2 BMSCs were cryo-preserved for subsequent experiments.

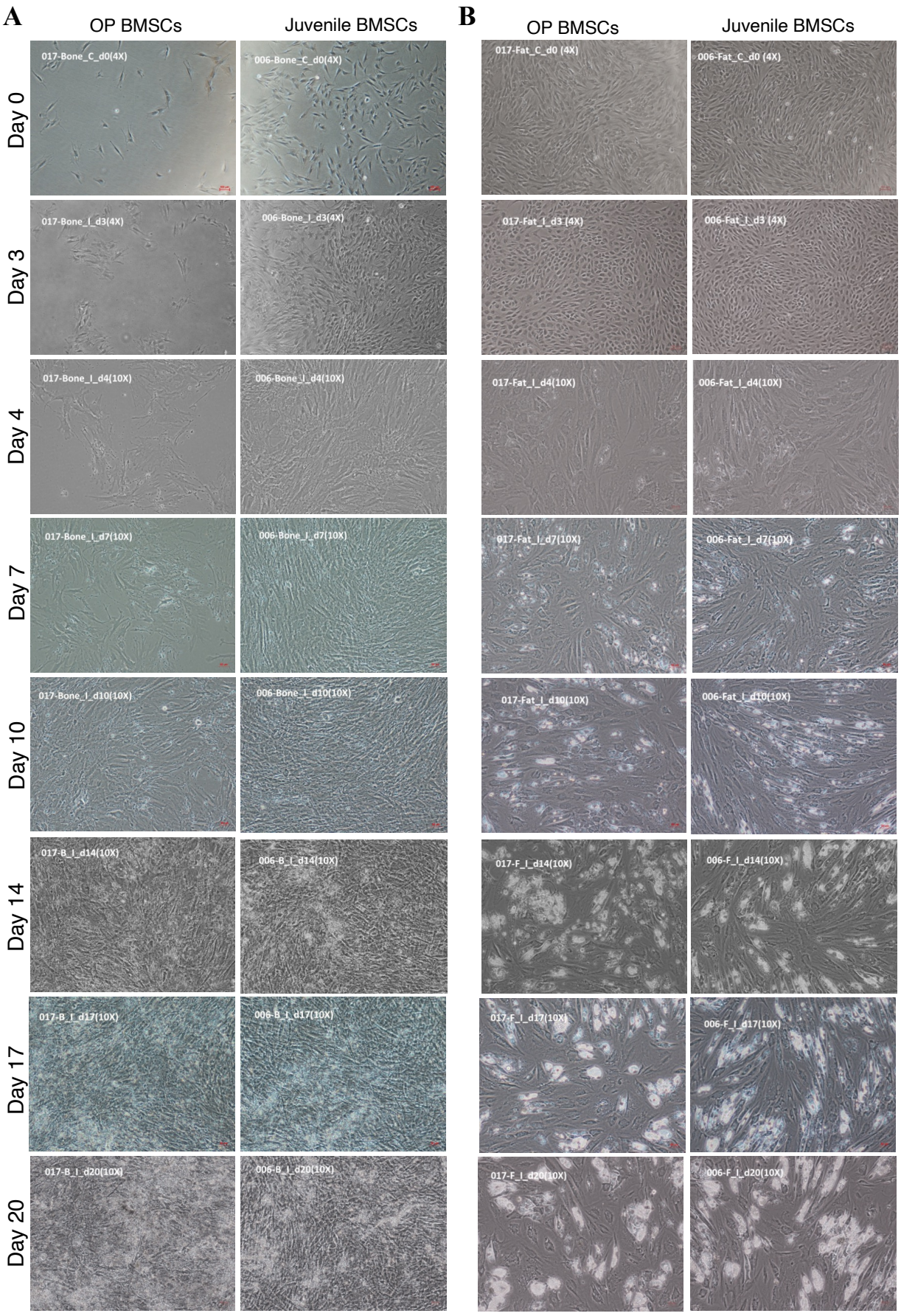

Figure S2. Representative images examined the longitudinal cultivation of the osteogenic and adipogenic differentiation capability of BMSCs retrieved from OP patients and healthy donors. **A** osteogenic differentiation. **B** adipogenic differentiation. Bright-field images. Magnification: 100×.