SUPPLEMENTAL MATERIAL

Sample Processing and Purification

Collagen purification was performed under sterile conditions in a laboratory with no contamination with ^{14}C in order to avoid sample contamination and false increase of ^{14}C levels. For isolation of collagen from CAs, cerebral arteries and mouse tendons, tissue fragments were minced with a scalpel to increase protease accessibility. Tissue fragments were suspended in at least 1 mL of 20 mmol/L HCl. Collagens were extracted after digestion with 100 μg of pepsin/g of tissue at 4°C for 72 hours and were precipitated for 6 hours after addition of solid NaCl to a final concentration of 2.5 mol/L. After centrifugation, collagen was re-dissolved in 20 mmol/L HCl and exhaustively dialyzed against 20 mmol/L HCl. The dialysate was lyophilized using a Concentrator Plus ® (Eppendorf, Hamburg, Germany) and subjected to birth dating by ^{14}C-accelerator mass spectrometry (AMS). For selected samples, collagen content and purity were assessed by sodium dodecyl-polyacrylamide gel electrophoresis (SDS-PAGE) and residual tissue fragments after pepsin digestion were used to quantify the amount of remaining collagens using the total collagen assay (Quickzyme biosciences, Leiden, Netherlands) according to the manufacturer's instructions.

Birth Dating of CA Collagen

All ^{14}C-AMS analyses were performed blinded to patient and CA-related data. Purified collagen samples were transferred to 6 mm O.D. quartz combustion tubes and lyophilized. Excess copper oxide was added to each dry sample and tubes were evacuated and sealed with a H_2/O_2 torch. Samples were combusted at 900°C for 3.5 hours and allowed to cool to room temperature overnight. The evolved CO_2 from each sample was cryogenically purified, trapped and reduced to graphite in the presence of iron catalyst in individual reactors.[1, 2] The $^{14}C/C$ concentration in the graphite was measured at the Centre for AMS, Lawrence Livermore National Laboratory using the 10 MV High Voltage Engineering Europa FN-class tandem electrostatic AMS spectrometer with standard measurement protocols.[3] The collagen samples were measured for 30,000 ^{14}C counts per cycle for five to eight cycle repetitions to achieve measurement errors within 0·3-0·8%. Corrections for background contamination of fossil and contemporary carbon introduced during AMS sample preparation were made using standard procedures.[3, 4] The concentration of $^{14}C/C$ was expressed using the $F^{14}C$ nomenclature ± 1 standard deviation (SD).[5] The intercept date range corresponds to the two

SD range of atmospheric $^{14}C/C$ mapped onto the chronological record, corresponding to a chronological uncertainty of one to three years in most cases. Age of CA collagen was estimated based on intercept date ranges.

SUPLLEMENTAL REFERENCES

1. Santos GM, Southon JR, Druffel-Rodriguez KC, Griffin S, Mazon M. Magnesium perchlorate as an alternative water trap in ams graphite sample preparation: A report on sample preparation at kccams at the university of california, irvine. *Radiocarbon*. 2004;46:165-173

2. Vogel JS, Southon JR, Nelson DE. Catalyst and binder effects in the use of filamentous graphite for ams. *Nucl. Instrum. Methods Phys. Res. Sect. B*. 1987;29 50-56

3. Buchholz BA, Spalding KL. Year of birth determination using radiocarbon dating of dental enamel. *Surface and interface analysis : SIA*. 2010;42:398-401

4. Brown TA, Southon JR. Corrections for contamination background in ams 14c measurements. *Nucl. Instrum. Methods Phys. Res. Sect. B* 1997;123:208-213

5. Reimer PJ. Solar physics: Spots from rings. *Nature*. 2004;431:1047-1048

SUPPLEMENTAL Table I

Sample No.	Sex	Patient age	Aneurysm Location	Diameter (mm)	AR	Aneurysm Irregularity	Risk factor(s)	SAH	Aneurysm excision	$F^{14}C$ (±1 SD)	Intercept year range	Estimated collagen age (years)
1	F	56	Pcom	10	1.8	yes	No	Yes	2009	1.068 ± 0.0051	2004-2007	4
2	M	77	PICA	12	4.0	no	Yes	Yes	2009	1.057 ± 0.0039	2005-2009	2
3	M	77	PICA	12	4.0	no	Yes	Yes	2009	1.052 ± 0.0038	2006-2010	1
4	F	53	MCA	5	1.4	yes	No	Yes	2010	1.035 ± 0.0036	2010- 2015	<1
5	F	74	MCA	13	1.3	no	Yes	No	2010	1.053 ± 0.0039	2007-2010	1
6	M	57	PICA	8	1.8	no	Yes	Yes	2010	1.043 ± 0.0038	2008-2013	1
7	F	47	Pcom	12	1.3	no	No	Yes	2010	1.062 ± 0.0090	2003-2010	4
8	F	47	Pcom	12	1.3	no	No	Yes	2010	1.109 ± 0.0108	1994-2002	12
9	F	61	MCA	7	0.6	no	Yes	Yes	2010	1.067 ± 0.0104	2002-2010	4
10	M	48	MCA	40	7.0	no	Yes	No	2010	1.050 ± 0.0068	2005-2012	2
11	F	74	PCA	15	0.9	no	No	No	2010	1.036 ± 0.0039	2010-2015	<1
12	F	49	MCA	5	1.4	yes	Yes	Yes	2010	1.064 ± 0.0123	2002-2011	5
13	F	53	MCA	8	2.2	yes	Yes	Yes	2011	1.037 ± 0.0039	2010-2014	<1
14	M	51	MCA	6	1.0	yes	Yes	Yes	2011	1.057 ± 0.0085	2004-2011	3
15	F	43	MCA	4	1.5	no	Yes	Yes	2011	1.037 ± 0.0052	2009-2016	<1
16	M	52	Acom	5	1.2	yes	Yes	Yes	2011	1.051 ± 0.0047	2006-2011	3
17	M	54	Pcom	12	1.8	yes	Yes	Yes	2011	1.039 ± 0.0044	2009-2014	<1
18	F	62	PICA	6	2.3	no	Yes	Yes	2011	1.043 ± 0.0037	2008-2013	1
19	F	48	Pcom	6	1.7	no	No	No	2011	1.053 ± 0.0046	2006-2010	3
20	F	62	MCA	10	3.2	no	Yes	No	2011	1.038 ± 0.0039	2010-2015	<1
21	F	41	Acom	9	2.3	yes	Yes	Yes	2011	1.036 ± 0.0049	2010-2014	<1
22	F	51	ACA	7	2.8	no	Yes	Yes	2011	1.033 ± 0.0044	2011-2015	<1
23	F	52	MCA	9	2.0	no	Yes	No	2012	1.043 ± 0.0045	2008-2014	1
24	M	45	MCA	6	1.3	yes	Yes	Yes	2012	1.053 ± 0.0144	2003-2017	2
25	M	51	MCA	6	1.7	yes	Yes	Yes	2012	1.044 ± 0.0067	2007-2014	2
26	F	47	MCA	5	1.9	yes	Yes	Yes	2012	1.048 ± 0.0059	2006-2012	3
27	F	82	MCA	16	3.0	no	Yes	Yes	2012	1.026 ± 0.0082	2010-2020	<1
28	F	47	MCA	6	2.1	no	Yes	Yes	2012	1.041 ± 0.0049	2008-2014	1

29	M	64	Acom	12	2.5	yes	Yes	Yes	2012	1.051 ± 0.0104	2004-2014	3
30	M	47	Pcom	7	1.8	no	No	Yes	2012	1.061 ± 0.0077	2004-2010	6
31	M	45	MCA	10	2.0	yes	No	Yes	2012	1.040 ± 0.0045	2009-2014	1
32	F	45	PCA	10	3.0	no	Yes	Yes	2012	1.039 ± 0.0055	2009-2014	1
33	M	29	MCA	7	1.8	yes	No	Yes	2012	1.068 ± 0.0059	2003-2007	7
34	F	62	MCA	6	1.2	yes	Yes	Yes	2012	1.030 ± 0.0052	2011-2017	<1
35	F	59	MCA	7	2.4	no	Yes	No	2012	1.049 ± 0.0103	2005-2015	2
36	F	48	MCA	8	1.4	no	Yes	No	2012	1.052 ± 0.0046	2006-2010	4
37	M	66	PICA	3	2.0	no	Yes	Yes	2012	1.029 ± 0.0040	2012-2017	<1
38	M	66	PICA	5	3.3	no	Yes	Yes	2012	1.039 ± 0.0040	2009-2014	1
39	F	45	ACA	4	0.7	no	No	Yes	2012	1.060 ± 0.0060	2004-2009	5
40	M	53	Acom	6	1.1	yes	Yes	Yes	2012	1.030 ± 0.0050	2011-2018	<1
41	F	50	Pcom	6	1.8	yes	Yes	Yes	2012	1.031 ± 0.0143	2006-2020	<1
42	F	47	MCA	8	2.1	yes	No	No	2012	1.045 ± 0.0060	2007-2014	2
43	M	53	ICA	6	1.2	no	Yes	Yes	2013	1.022 ± 0.0053	2013-2020	<1
44	F	72	Pcom	8	2.0	yes	no	No	2013	1.039 ± 0.0034	2009-2014	2
45	F	78	Pcom	8	2.7	no	Yes	yes	2013	1.039 ± 0.0039	2009-2014	2
46	F	44	Acom	6	1.6	no	Yes	yes	2013	1.039 ± 0.0037	2009-2014	2

Epidemiological data, radiological and chronological aneurysm measurements for every patient and CA. The incidence of potential risk factors for aneurysm formation and rupture, such as hypertension, cigarette smoking, cocaine use or their combination were concluded and dichotomized (yes vs. no). The chronological range of each CA depends upon the measurement precision and slope of the bomb curve at the intercept. Abbreviations: ACA indicates Anterior Cerebral Artery; AR, aspect ratio (aneurysm dome/neck diameter); ACom, Anterior Communicating Artery; F, female; M, male; MCA, Middle Cerebral Artery; PCom, Posterior Communicating Artery; PICA, Posterior Inferior Cerebral Artery; PCA, Posterior Cerebral Artery.