SUPPLEMENTARY INFORMATION

Early Neolithic executions indicated by clustered cranial trauma in the mass grave of Halberstadt

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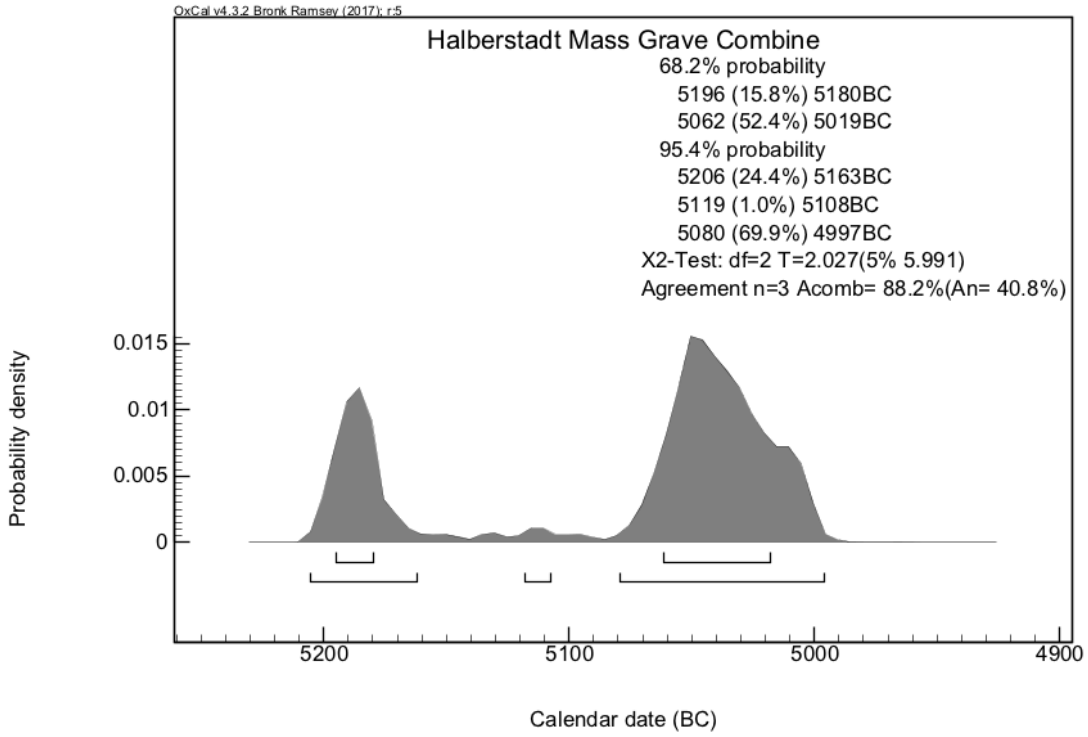
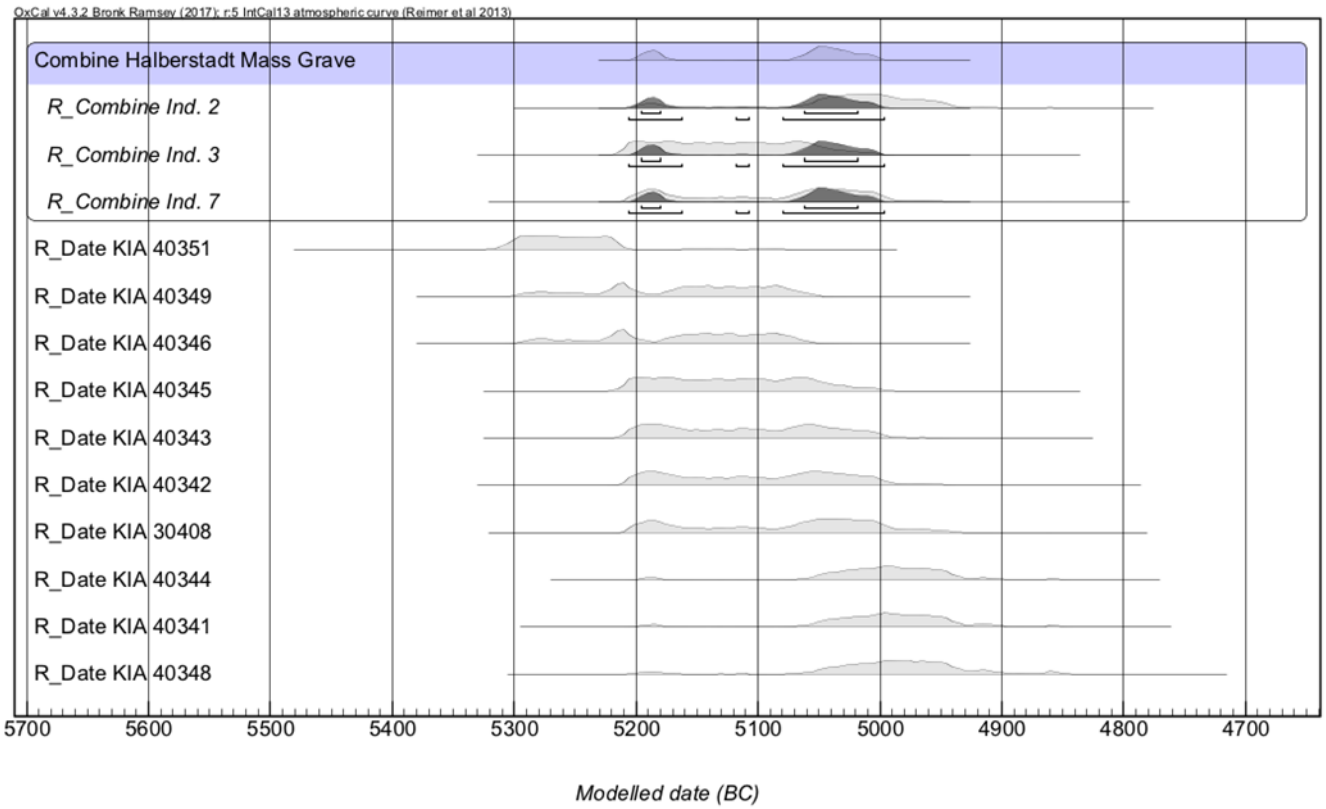
Supplementary Figure 1. Map of Central Europe showing the site of Halberstadt-Sonntagsfeld (star) located within Germany (dark grey) and the German state of Saxony-Anhalt (light grey).



Supplementary Figure 2. Single plot of "combined" radiocarbon dating results of six different bones from three different individuals from the mass grave of Halberstadt (using OxCal v4.3/IntCal13)[1,2].



Supplementary Figure 3. Multiplot of "combined" radiocarbon dating results of six different bones from three different individuals from the mass grave of Halberstadt (using OxCal v4.3/IntCal13)[1,2], supplemented by previously published radiocarbon dating results of the regular Halberstadt LBK settlement burials[3].

Supplementary Table 1. Radiocarbon dating results of six different bones from three different individuals from the mass grave of Halberstadt, including OxCal v4.3/IntCal13[1,2] "R_Combine" results for each dated individual. y – years.

Lab no.	Ind.	Sample	14C age, y	±	Cal 1 σ	Cal 2 σ
MAMS 23988	2	Vertebra	6093	42	cal BC 5193-4943	cal BC 5208-4856
MAMS 23989	2	Rib	6096	42	cal BC 5194-4944	cal BC 5208-4859
Combined	2	-	6095	30	cal BC 5051-4962	cal BC 5206-4911
MAMS 23990	3	Rib	6141	42	cal BC 5207-5010	cal BC 5215-4965
MAMS 23991	3	Fibula	6183	42	cal BC 5212-5066	cal BC 5289-5004
Combined	3	-	6162	30	cal BC 5207-5056	cal BC 5214-5024
MAMS 23992	7	Fibula	6134	43	cal BC 5207-5000	cal BC 5213-4962
MAMS 23993	7	Rib	6122	43	cal BC 5207-4988	cal BC 5210-4949
Combined	7	-	6128	31	cal BC 5205-4997	cal BC 5210-4986

Supplementary Table 2. Carbon and nitrogen isotope data of bone collagen of the individuals interred in the mass grave at Halberstadt. The collagen yields, C and N contents and atomic C/N ratios of all samples are in agreement with accepted quality criteria[4].

Ind.	Sample	Collagen yield (%)	C (%)	N (%)	Atomic C/N	$\delta^{13}C$ (‰ vs. V-PDB)	$\delta^{15}N$ (‰ vs. AIR)
1	Pelvis	8.1	43.1	15.3	3.3	-20.16	9.79
2	Rib	5.7	42.8	15.0	3.3	-19.94	10.17
3	Rib	5.1	41.8	14.7	3.3	-20.19	8.63
4	Rib	5.2	42.5	14.9	3.3	-20.13	10.08
5	Rib	7.3	42.9	15.1	3.3	-20.08	9.27
6	Rib	5.6	42.7	15.0	3.3	-20.16	10.08
7	Rib	8.2	43.3	15.3	3.3	-20.10	8.80
8	Rib	5.5	43.1	15.1	3.3	-19.95	9.90
9	Atlas	9.0	42.9	15.1	3.3	-20.09	9.72

Supplementary Table 3. Strontium isotope data of tooth enamel (permanent molars) of the individuals found in the mass grave at Halberstadt.

Ind.	Tooth	$^{87}Sr/^{86}Sr$	2 SD	Tooth	$^{87}Sr/^{86}Sr$	2 SD
1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	M 36	0.71071	0.00002	M 28	0.70971	0.00002
5	M 16	0.71014	0.00002	M 18	0.71039	0.00001
6	M 46	0.71045	0.00001	M 48	0.71052	0.00002
7	M 16	0.70841	0.00001	M 18	0.70981	0.00001
8	M 36	0.71084	0.00002	M 38	0.71151	0.00002
9	M 16	0.70881	0.00002	M 18	0.70870	0.00004

Supplementary Table 4. Comparative strontium isotope data of tooth enamel (first molars and deciduous teeth) of settlement burials at Halberstadt.

Lab no.	$^{87}Sr/^{86}Sr$	2 SD	Lab no.	$^{87}Sr/^{86}Sr$	2 SD
HAL_1	0.70894	0.00003	HAL_16	0.70959	0.00001
HAL_2	0.71229	0.00010	HAL_17	0.70980	0.00004
HAL_3	0.70922	0.00003	HAL_18	0.70850	0.00005
HAL_4	0.70915	0.00006	HAL_19	0.70897	0.00006
HAL_5	0.70915	0.00003	HAL_20	0.70903	0.00007
HAL_6	0.70850	0.00003	HAL_21	0.70986	0.00002
HAL_7	0.70919	0.00002	HAL_22	0.70834	0.00004
HAL_8	0.70899	0.00003	HAL_23	0.70838	0.00001
HAL_9	0.70859	0.00002	HAL_24	0.70842	0.00004
HAL_10	0.70898	0.00002	HAL_25	0.70847	0.00004
HAL_11	0.70868	0.00002	HAL_26	0.70905	0.00004
HAL_12	0.70856	0.00005	HAL_27	0.70913	0.00003
HAL_13	0.70890	0.00001	HAL_28	0.70937	0.00006
HAL_14	0.70926	0.00003	HAL_29	0.70827	0.00006
HAL_15	0.70924	0.00002	HAL_30	0.70849	0.00001

Supplementary References

1. Bronk Ramsey, C. Bayesian analysis of radiocarbon dates. *Radiocarbon* **51,** 337-360 (2009).
2. Reimer, P. J. et al. IntCal13 and Marine13 radiocarbon age calibration curves 0-50,000 years cal BP. *Radiocarbon* **55,** 1869-1887 (2013).
3. Brandt, G. et al. Ancient DNA reveals key stages in the formation of Central European mitochondrial genetic diversity. *Science* **342,** 257-261 (2013).
4. van Klinken, G. J. Bone collagen quality indicators for palaeodietary and radiocarbon measurements. *J. Archaeol. Sci.* **26,** 687-695 (1999).