Supplementary material for Kim et al., The volumetric change and dose-response relationship following hypofractionated proton therapy for chordomas, *Acta Oncologica*, 2014;53:563–8.

Supplementary Figure A1. Change in tumor volume ratio in each patient. Patients 4 and 20 developed local recurrence. The points representing progression after an initial response were discarded. Patients 2 and 15 were excluded because the background bone, within which the tumor was disseminated, showed mixed changes in intensity that made volume evaluation impossible.

Supplementary Figure A2. Compilation of 3-year local control rates for the treatment of chordoma achieved in several reports in the literature. Doses were converted to EQD2 using the formula $\alpha/\beta = 3$ Gy. The error bars indicate the dose range applied in the study. A dose-response model was adjusted to the data (solid line). The outcome of the current study is displayed in two groups according to the dose level (I, 64.8 CGE; II, 69.6 CGE–74.4 CGE). a, photon; b, photon + proton; c, carbon; d, proton.

Supplementary Figure A3. The following logistic dose-response model equation was adjusted using a maximum likelihood procedure with various α/β ratio (2, 3, 5, and 10 Gy): $P(D)[\%] = 100 \cdot \exp(C1D - C2) / [1 + \exp(C1D - C2)]$.

Supplementary Figure A4. The values of EQD2 for local control rates of 50%, 80%, and 90% at 5 years were estimated to be 62.1, 72.8, and 79.1 CGE, respectively.

Supplementary Table A1. Comparison of photon vs. photon + proton vs. carbon vs. proton.

	Authors	No. of the patients	Median FU (year)	Median Dose (Gy or CGE)	Fractions	Median EQD2 ($\alpha/\beta = 3$)	3-yr local control rate (%)	5-yr local control rate (%)
Photon	Catton, 1996 [8]	23	5.2	50	25	50.0	40	23
	Debus, 2000 [9]	37	7.9	66.6	37	63.9	60	50
	Bois, 2010 [10]	34	4.5	66	33	66.0	22	N/A
Photon + Proton	Fagundes, 1995 [11]	204	4.5	70.1	39	67.3	N/A	69
	Noel, 2005 [12]	100	2.6	67	37	64.5	86	N/A
Carbon	Shults-Ertner, 2007 [2]	96	2.6 (mean)	60	20	72.0	80	70
	Mizoe, 2009 [13]	19	4.4 (mean)	60.8	16	82.7	100	100
	Imai, 2011 [14]	95	3.5	70.4	16	104.2	98	88
Proton	Hug, 1999 [4]	30	33.2	71.9	38	70.3	67	59
	Weber, 2005 [15]	18	2.4	74	37	74.0	87.5	N/A
	Rutz, 2007 [16]	26	3	72	36	72.0	77	N/A
	Ares, 2009 [5]	42	3.2 (mean)	73.5	39	71.8	88	81
	Staab, 2011 [17]	19	3.6	72.5	36	72.7	100	100
	Yasuda, 2012 [18]	40	4.7	68.9	35	68.5	N/A	70
	Current study	7	3.6	64.8	27	70.0	60	N/A
		13		69.6	29	75.2	100	N/A

FU, follow-up; CGE, cobalt gray equivalent = proton dose in Gy $\times$ 1.1; EQD2, equivalent dose delivered in 2 CGE per fraction; N/A, not available.