Joint	Age	Gender		Total Extracted	Gu-HCl Extraction 1		Gu-HCl Extraction 2		Gu-HCl Extraction 3		Gu-HCl Extraction 4		Gu-HCl Extraction 5	
					µg/mg	%	µg/mg	%	µg/mg	%	µg/mg	%	µg/mg	%
Hip	69	Female	GAG ug/mg of cartilage	281.7	279.2	99.1	1.1	0.4	0.5	0.2	0.5	0.2	0.4	0.2
				259.5	257.4	99.2	0.8	0.3	0.5	0.2	0.4	0.1	0.4	0.2
				297.5	295.2	99.2	0.9	0.3	0.5	0.2	0.5	0.2	0.4	0.1
			Average ±SD	279.6 ±19.1	277.2 ±19.0	99.2 ±0.1	0.9±0.2	0.3±0.1	0.5±0.0	0.2±0.0	0.5±0.1	0.2±0.0	0.4±0.0	0.2±0.0
			Protein ug/mg of cartilage	15.0	15.0	100.0	-	-	-	-	-	-	-	-
				13.3	13.3	100.0	-	-	-	-	-	-	-	-
				14.2	14.2	100.0	-	-	-	-	-	-	-	-
			Average ±SD	14.2±0.9	14.2±0.9	100.0±0.0	-	-	-	-	-	-	-	-
Knee	77	male	GAG ug/mg of cartilage	185.5	182.5	98.4	1.1	0.6	0.6	0.3	0.6	0.3	0.6	0.3
				200.7	197.7	98.5	1.1	0.5	0.6	0.3	0.6	0.3	0.6	0.3
				197.0	194.0	98.5	1.2	0.6	0.6	0.3	0.5	0.3	0.6	0.3
			Average ±SD	194.4±7.9	191.4±7.9	98.5±0.1	1.1±0.1	0.6±0.0	0.6±0.0	0.3±0.0	0.6±0.1	0.3±0.0	0.6±0.0	0.3±0.0
			Protein ug/mg of cartilage	10.8	10.8	100.0	-	-	-	-	-	-	-	-
				11.2	11.2	100.0	-	-	-	-	-	-	-	-
				9.4	9.4	100.0	-	-	-	-	-	-	-	-
			Average ±SD	10.5±0.9	10.5±0.9	100.0±0.0	-	-	-	-	-	-	-	-

Supplemental Table 1. Data from cartilage extraction optimization experiments demonstrating highly efficient extraction of soluble proteins from cartilage with a single Gu-HCl incubation. Two non-OA cartilage samples were extracted in triplicate with five sequential Gu-HCl extractions to determine the efficiency of the extraction protocol. Total protein was determined using the Bradford protein assay and total glycosaminoglycan (GAG) was determined using the dimethylmethylene blue (DMMB assay). Results were normalized to cartilage wet weight.

Modified Peptide Sequence	Charge State	Monoisotopic m/z	Peak Centroid Time	HIP OA peak intensity	Knee OA peak intensity	Control peak intensity
Insoluble						
NTVMECDACGMQQSVR (estimated % of Total Cartilage Content)	2	943.38727	36.648	57,802 (3.0%)	27,302 (50.3%)	144,711 (20.2%)
DTVMECDACGMQQSVR	2	943.8796		none detected	none detected	none detected
Soluble (Gu-HCl extract)						
NTVMECDACGMQQSVR	2	943.3874	44.807	1,861,624	27,015	572,066
DTVMECDACGMQQSVR	2	943.8796	46.666	384,398	8	106,304
			Ratio (D/N COMP) in soluble fraction	0.2065	0.0003	0.1858

Supplemental Table 2. Native COMP but not deamidated COMP is detected in the insoluble fraction of cartilage after extraction with Gu-HCl. *Three cartilage samples [hip OA lesional (72 years), knee OA lesional (75 years) and on non-OA hip (76 years)] were extracted with Gu-HCl as per our standard protocol to yield soluble proteins (Gu-HCl extractable) and insoluble residual proteins. The soluble protein fractions were prepared for LC-MS/MS by extensive dialysis over 3 days at 4^{O}C with 5 changes of 50 mM ammonium bicarbonate, pH7.8, per day. The insoluble cartilage protein fractions were also similarly washed to remove the Gu-HCl. Samples were trypsinized using standard protocols and separated by LC-MS/MS on a Waters Synapt G2 mass spectrometer. Data were aligned and label-free quantification and integration of qualitative peptide identifications was performed using Rosetta Elucidator (v 3.3, Rosetta Inpharmatics, Seattle, WA). Peptides corresponding to native (non-deamidated) COMP (**N**$_{64}$TVMECDACGMQQSVR) and deamidated D-COMP (**D**$_{64}$TVMECDACGMQQSVR) were identified in the soluble fractions but only native COMP was identified in the non-soluble cartilage protein fraction. The proportion of native COMP remaining in cartilage after extraction was estimated based on the total yield of the soluble and insoluble fractions from each sample. The ratios of the intensity of the Deamidated/Native COMP peptide in the soluble protein fractions confirmed the abundance of extractable deamidated COMP from hip compared with knee cartilage.*