

Supplementary Information

Long term fate and efficacy of biomimetic apatite-coated carbon patch used for bone reconstruction

Florian Olivier, Christophe Drouet, Olivier Marsan, Vincent Sarou-Kanian, Samah Rekima, Nadine Gautier, Franck Fayon, Sylvie Bonnamy and Nathalie Rochet

Figure S1. Illustration of the segmentation method used to detect carbon material from histological slides. Microscopic images before (left side) and after segmentation (right side) of carbon (red) versus tissue (green).

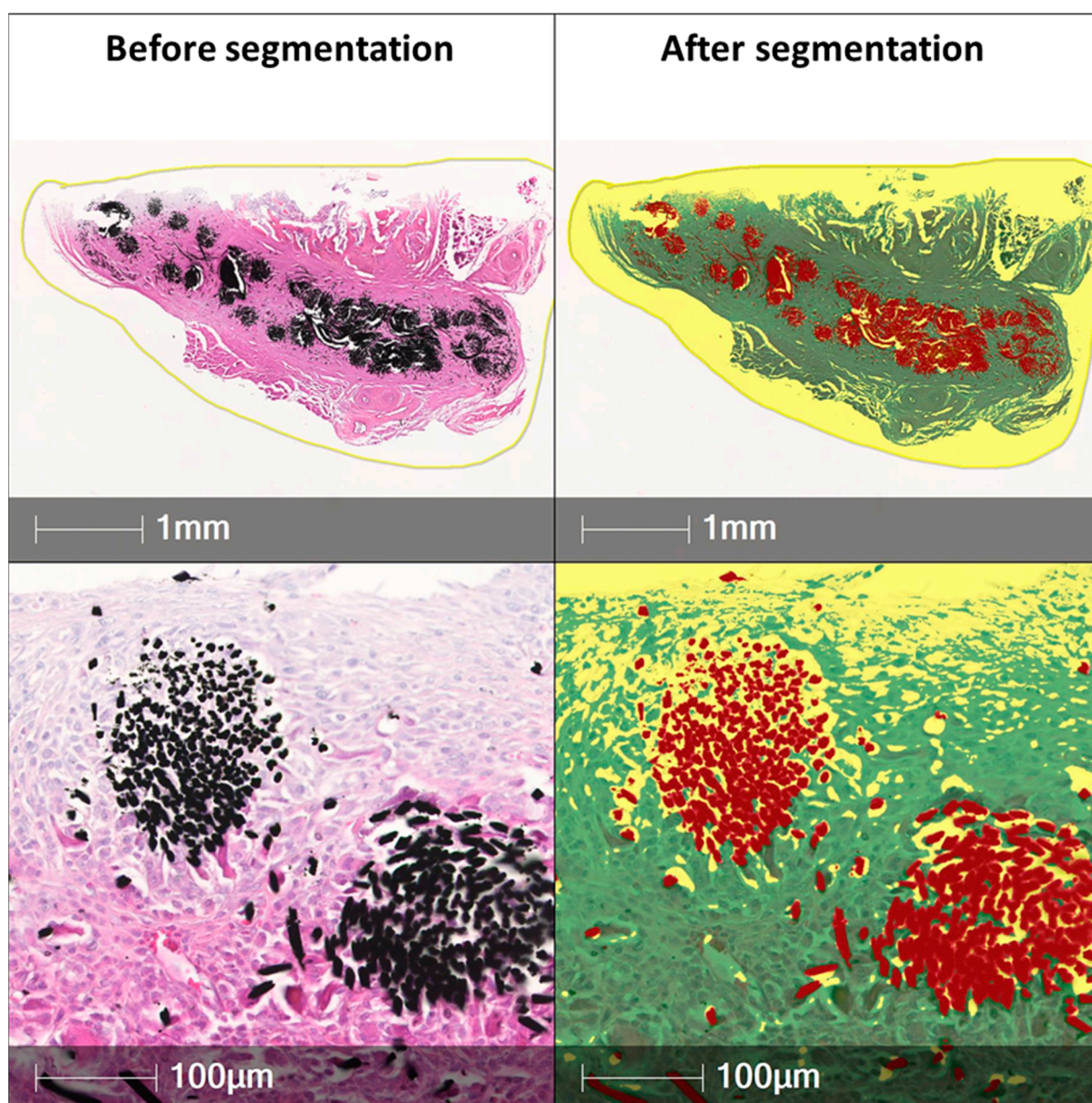


Figure S2. Raman spectra of the newly-formed bone from several punctual analyses for the three groups tested *in vivo* (control, ACC/CDA and ACC/10Sr-CDA). The similarity in position and width of the $\nu_1(\text{PO}_4)$ band is in particular highlighted.

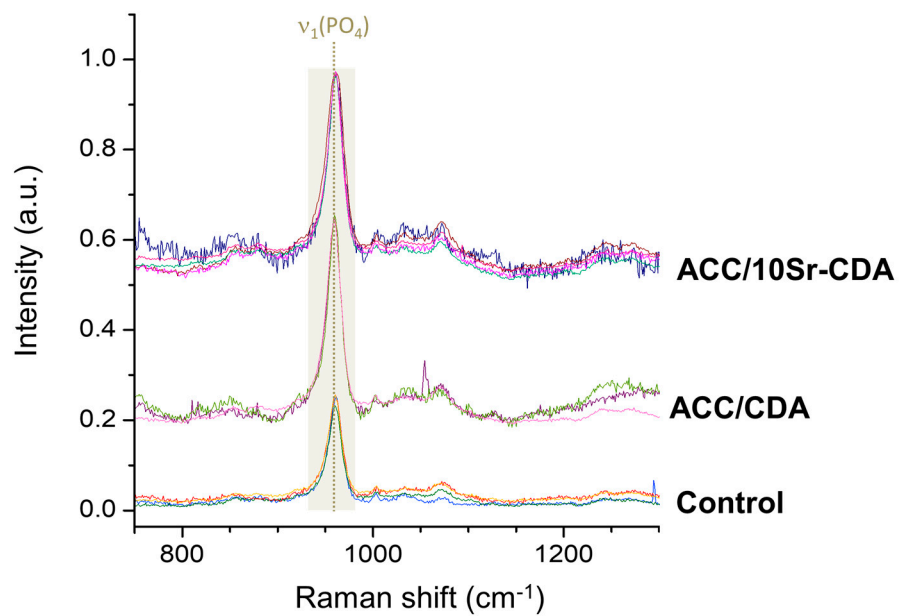


Table S1. Raman band characteristics after curve-fitting for different depths Z of analysis.

| Sample positioning along Z axis | Remarkable peak assignments | Peak position | Peak height | Gaussian/Lorentzian mixing parameter (0 = L; 1 = G) | Peak width | Peak area |
|---------------------------------|-----------------------------|---------------|-------------|---|------------|-----------|
| Z = 0 μm | | 824.2 | 192.9 | 1 | 18.3 | 3748.0 |
| | proline | 850.2 | 663.7 | 0.25 | 19.9 | 18007.8 |
| | | 859.9 | 222.1 | 0.97 | 9.4 | 2262.4 |
| | hydroxyproline | 875.1 | 494.6 | 1 | 22.4 | 11804.6 |
| | | 893.7 | 273.6 | 0.32 | 15.2 | 5718.9 |
| | | 923.9 | 742.2 | 0.25 | 39.5 | 40231.4 |
| | v1(PO4) am | 955.3 | 2043.3 | 0.61 | 28.0 | 71030.3 |
| | v1(PO4) ap | 961.7 | 6230.4 | 0.44 | 13.2 | 109187.0 |
| | | 1003.6 | 665.7 | 0 | 8.3 | 8560.7 |
| | | 1035.0 | 1067.2 | 0.14 | 46.4 | 71267.7 |
| | v1(CO3) | 1071.6 | 538.4 | 0.51 | 21.1 | 14721.0 |
| | | 1085.1 | 478.7 | 1 | 50.0 | 25476.2 |
| | | 1184.4 | 137.9 | 1 | 26.9 | 3948.7 |
| | | 1206.7 | 257.9 | 0.4 | 13.2 | 4603.5 |
| | amide III | 1241.4 | 359.3 | 1 | 23.8 | 9108.9 |
| | amide III | 1270.1 | 798.0 | 0.11 | 48.3 | 56048.8 |
| | amide III | 1305.1 | 432.6 | 1 | 20.3 | 9327.4 |
| | | 1385.9 | 315.3 | 1 | 14.7 | 4933.4 |
| | | 1402.7 | 212.3 | 0.5 | 22.1 | 6082.4 |
| | CH2 | 1441.6 | 719.6 | 0.36 | 38.2 | 36509.5 |
| | CH2 | 1453.4 | 799.7 | 1 | 32.9 | 28030.5 |
| Z = 200 μm | proline | 854.7 | 479.5 | 0.45 | 27.0 | 16876.0 |
| | hydroxyproline | 878.8 | 179.4 | 1 | 15.2 | 2896.5 |
| | v1(PO4) am | 946.1 | 1103.3 | 0.03 | 17.9 | 30214.2 |
| | v1(PO4) ap | 960.5 | 6160.1 | 0.87 | 15.9 | 110582.4 |
| | | 1039.7 | 430.2 | 1 | 45.7 | 20943.4 |
| | v1(CO3) | 1072.1 | 792.0 | 0.79 | 20.9 | 19223.4 |
| | | 1096.7 | 337.6 | 1 | 37.2 | 13381.1 |
| | amide III | 1241.8 | 334.7 | 0.57 | 22.4 | 9544.1 |
| | amide III | 1271.2 | 376.5 | 0 | 30.8 | 17709.7 |
| | | 1340.8 | 3591.2 | 0.07 | 0.0 | 153.8 |
| | | 1389.5 | 202.9 | 0.42 | 29.2 | 7873.3 |
| | | 1422.9 | 342.3 | 0 | 24.8 | 12880.2 |
| | CH2 | 1448.4 | 581.8 | 0.77 | 22.7 | 15354.4 |
| | CH2 | 1464.4 | 318.8 | 1 | 21.4 | 7263.3 |
| Z = 400 μm | | 814.8 | 329.8 | 0.43 | 17.9 | 7707.64 |
| | | 833.6 | 282.4 | 1 | 14.0 | 4221.76 |
| | proline | 853.0 | 735.7 | 1 | 18.2 | 14235.39 |
| | hydroxyproline | 875.2 | 499.8 | 1 | 21.8 | 11609.33 |
| | v1(PO4) am | 953.9 | 3724.9 | 0.41 | 21.7 | 108387.29 |
| | v1(PO4) ap | 963.3 | 4157.4 | 1 | 14.6 | 64414.71 |
| | | 1004.5 | 241.3 | 0.48 | 7.4 | 2364.74 |
| | | 1032.4 | 630.6 | 0.08 | 17.0 | 16206.71 |
| | | 1049.2 | 401.5 | 1 | 17.4 | 7429.4 |
| | v1(CO3) | 1072.0 | 1393.9 | 0.45 | 22.4 | 41465.02 |
| | | 1097.1 | 465.8 | 0.55 | 37.1 | 21983.41 |
| | | 1125.5 | 70.3 | 1 | 9.4 | 703.27 |
| | amide III | 1243.6 | 527.3 | 0.47 | 23.9 | 16577.44 |
| | amide III | 1272.6 | 391.0 | 0.6 | 24.3 | 11924.97 |
| | | 1385.1 | 256.3 | 0.82 | 19.0 | 5570.12 |
| | | 1401.6 | 201.2 | 1 | 11.0 | 2347.33 |
| | | 1423.4 | 575.5 | 0 | 37.8 | 32388.66 |
| | CH2 | 1451.7 | 621.1 | 1 | 26.4 | 17465.01 |
| | CH2 | 1463.2 | 430.0 | 1 | 27.5 | 12586.23 |

Table S1. (continued)

| Sample positioning along Z axis | Remarkable peak assignments | Peak position | Peak height | Gaussian/Lorentzian mixing parameter (0 = L; 1 = G) | Peak width | Peak area |
|---------------------------------|-----------------------------|---------------|-------------|---|------------|-----------|
| Z = 600 μm | | 814.4 | 100.3 | 1 | 9.2 | 981.04 |
| | | 827.1 | 61.2 | 0.81 | 13.0 | 916.45 |
| | proline | 854.3 | 538.7 | 0 | 30.9 | 24756.13 |
| | hydroxyproline | 878.7 | 258.1 | 1 | 14.0 | 3842.8 |
| | v1(PO4) am | 947.3 | 1210.0 | 0.81 | 20.8 | 29041.57 |
| | v1(PO4) ap | 961.0 | 6036.8 | 0.91 | 16.1 | 107412.78 |
| | | 1037.1 | 435.0 | 0.03 | 33.7 | 22123.26 |
| | v1(CO3) | 1072.2 | 1072.8 | 0 | 27.1 | 44575.56 |
| | | 1102.6 | 182.1 | 1 | 35.7 | 6912 |
| | amide III | 1242.9 | 355.3 | 0.82 | 24.9 | 10171.55 |
| | amide III | 1272.3 | 264.5 | 0.53 | 25.7 | 8725.19 |
| | | 1375.2 | 411.5 | 1 | 19.2 | 8415.8 |
| | | 1402.5 | 841.4 | 0.72 | 23.0 | 23117.12 |
| | | 1422.1 | 273.4 | 0.32 | 17.0 | 6429.51 |
| | CH2 | 1450.7 | 625.1 | 0.79 | 30.2 | 21827.96 |
| | CH2 | 1467.3 | 242.5 | 0.35 | 26.4 | 8577.78 |
| Z = 800 μm | | 831.9 | 347.6 | 0.49 | 50.0 | 21525.27 |
| | proline | 855.8 | 515.9 | 0.88 | 19.8 | 11413.19 |
| | hydroxyproline | 879.3 | 560.3 | 0.97 | 17.6 | 10628.11 |
| | v1(PO4) am | 946.4 | 1163.2 | 0.61 | 18.7 | 27214.18 |
| | v1(PO4) ap | 960.5 | 6092.0 | 0.81 | 15.9 | 111854.21 |
| | | 1003.7 | 260.1 | 1 | 8.5 | 2346.54 |
| | | 1040.9 | 516.6 | 1 | 37.5 | 20608.02 |
| | | 1058.1 | 139.2 | 1 | 15.6 | 2317.35 |
| | v1(CO3) | 1071.0 | 671.4 | 1 | 15.6 | 11178.23 |
| | | 1083.5 | 586.6 | 0 | 28.8 | 25871.29 |
| | | 1104.5 | 191.3 | 0 | 31.3 | 9175.64 |
| | amide III | 1242.9 | 315.4 | 0.71 | 21.6 | 8195.04 |
| | amide III | 1271.6 | 323.9 | 0 | 25.4 | 12638.65 |
| | | 1342.9 | 137.5 | 1 | 8.2 | 1195.84 |
| | | 1387.5 | 267.2 | 1 | 25.1 | 7138.97 |
| | | 1404.0 | 183.8 | 1 | 9.7 | 1898.43 |
| | | 1421.5 | 413.9 | 0 | 25.7 | 16107.66 |
| Native cortical bone | CH2 | 1450.2 | 574.3 | 0.37 | 31.0 | 23736.17 |
| | CH2 | 1458.2 | 382.4 | 1 | 31.1 | 12675.06 |
| | | 814.0 | 170.4 | 0 | 16.2 | 4135.83 |
| | proline | 853.3 | 404.5 | 0 | 22.1 | 13508.32 |
| | hydroxyproline | 877.1 | 178.0 | 1 | 18.3 | 3468.73 |
| | v1(PO4) am | 951.1 | 1772.1 | 0.77 | 25.9 | 53638.68 |
| | v1(PO4) ap | 960.5 | 5214.0 | 0.88 | 15.5 | 90744.63 |
| | | 1002.9 | 254.1 | 1 | 6.3 | 1695.85 |
| | | 1033.1 | 286.6 | 0.35 | 18.1 | 7152.23 |
| | v1(CO3) | 1072.4 | 910.5 | 0 | 28.8 | 40252.93 |
| | | 1103.4 | 138.8 | 0 | 14.2 | 3050.87 |
| | | 1202.4 | 91.3 | 1 | 6.3 | 616.14 |
| | amide III | 1242.2 | 334.6 | 1 | 21.5 | 7667.61 |
| | amide III | 1270.5 | 329.1 | 0.02 | 31.8 | 15898.97 |
| | | 1420.9 | 302.8 | 0 | 50.0 | 22138.19 |
| | CH2 | 1455.0 | 534.6 | 1 | 29.6 | 16825.86 |
| | CH2 | 1470.7 | 8521.2 | 0.03 | 0.1 | 74.85 |