**Table S1. ATCM-activated protocol (Β): Linear regression fitting parameters (aT/bT, R2) between user-selected NI and measured image noise, P<0.001.**

|  |  |
| --- | --- |
| Age (y) | aΤ/bΤ, R2 |
|  | Head | Thorax | Abdomen/Pelvis |
| Neonate |  |  |  |
|  | 1.44/-1.67, 0.980 | 1.39/2.51, 0.957 | 0.97/4.02, 0.929 |
| 1 |  |  |  |
|  | 0.98/0.77, 0.965 | 1.46/-0.65, 0.974 | 0.88/3.33, 0.958 |
| 5 |  |  |  |
|  | 1.055/-0.33, 0.991 | 1.16/1.91, 0.966 | 1.09/0.38, 0.985 |
| 10 |  |  |  |
|  | 1.08/-0.38, 0.977 | 1.18/0.19, 0.978 | 1.01/1.79, 0.974 |

**Table S2. ATCM-activated protocol (Β): CNRI, CNRB, and CNRST versus NI, fitting (aS/bS, R2)parameters across phantoms and anatomical regions, P<0.001**

|  |  |
| --- | --- |
|  | aS/bS, R2 |
| Age (y) | Head | Thorax | Abdomen/Pelvis |
|  | CNRI versus NI |
| Neonate |  |  |  |
|  | 312.2/1.12, 0.966 | 630.3/1.25, 0.995 | 152.1/0.73, 0.997 |
| 1 |  |  |  |
|  | 280.1/0.95, 0.674 | 194.6/0.93, 0.993 | 155.1/0.91, 0.986 |
| 5 |  |  |  |
|  | 161.1/0.93, 0.957 | 281.5/1.07, 0.992 | 228.1/1.00, 0.992 |
| 10 |  |  |  |
|  | 194.4/1.10/0.947 | 204.9/0.99, 0.994 | 134.0/0.83, 0.972 |
|  | CNRB  versus NI |
| Neonate |  |  |  |
|  | 894.6/1.14, 0.965 | 1839/1.32, 0.995 | 409.9/0.73, 0.998 |
| 1 |  |  |  |
|  | 975.1/0.98, 0.967 | 677.8/0.92, 0.988 | 675.1/0.95, 0.991 |
| 5 |  |  |  |
|  | 900.5/0.95, 0.965 | 1208/1.06, 0.995 | 1027.1/1.03, 0.987 |
| 10 |  |  |  |
|  | 1045/1.14, 0.9982 | 863.4/0.97, 0.988 | 71.93/0.23, 0.967 |
|  | CNRST versus NI |
| Neonate |  |  |  |
|  | 43.10/-1.11, 0.935 | 170.5/1.57, 0.998 | 33.05/0.79, 0.993 |
| 1 |  |  |  |
|  | 76.2/1.00, 0.984 | 56.07/1.00, 0.831 | 70.10/0.11, 0.994 |
| 5 |  |  |  |
|  | 95.0/0.97, 0.984 | 49.96/0.93, 0.987 | 54.2/0.89/0.989 |
| 10 |  |  |  |
|  | 112.5/1.16, 0.959 | 47.42/0.86, 0.983  | 47.95/0.88, 0.957 |

**Table S3. ATVS-activated protocol (C): NI versus CNRI for CTA, CNRB for BONE, CNRI and CNRST for C+, and CNRST for C- clinical mode, fitting (aK/bK, R2)parameters across phantoms and anatomical regions, P<0.001.**

|  |  |
| --- | --- |
|  | aK/bK, R2 |
|  | Head | Thorax | Abdomen/Pelvis |
| Age (y) | CTA |
| Neonate |  |  |  |
|  | 84.6/0.61, 0.785 | 146.4/0.71, 0.898 | 192.2/0.84, 0.945 |
| 1 |  |  |  |
|  | 164.1/0.81, 0.847 | 150.3/0.82, 0.896 | 224.2/1.03, 0.969 |
| 5 |  |  |  |
|  | 148.8/0.85, 0.879 | 308.3/1.08, 0.783 | 336.2/1.08, 0.869 |
| 10 |  |  |  |
|  | 94.3/0.64, 0.744 | 110.9/0.77, 0.591 | 601.2/1.34, 0.751 |
|  | BONE |
| Neonate |  |  |  |
|  | 153.7/0.64, 0.818 | 700.9/0.96, 0.728 | 280.8/0.78, 0.890 |
| 1 |  |  |  |
|  | 1171.4/1.00, 0.979 | 1070.4/1.06, 0.988 | 916.0/1.06, 0.978 |
| 5 |  |  |  |
|  | 352.5/0.74, 0.985 | 283.4/0.726, 0.895 | 328.2/0.750, 0.879 |
| 10 |  |  |  |
|  | 206.0/0.68, 0.950 | 286.3/0.73, 0.950 | 283.1/0.73, 0.890 |
|  | C+ |
| Neonate |  |  |  |
|  | 122.2/0.71, 0.843 | 110/0.64, 0.721 | 125.9/0.650, 0.466 |
| 1 |  |  |  |
|  | 412.5/1.01, 0.897 | 410.8/1.09, 0.863 | 310.0/1.09, 0.598 |
| 5 |  |  |  |
|  | 816.5/1.30, 0.987 | 1035/1.44, 0.539 | 930.2/1.33, 0.679 |
| 10 |  |  |  |
|  | 67.1/0.60, 0.353 | 154.6/0.85, 0.725 | 593.4/1.36, 0.865 |
|  |  |  |  |
|  |  | C- |  |
| Neonate |  |  |  |
|  | 27.85/0.71, 0.853 | 22.12/0.7, 0.894 | 27.72/0.65, 0.654 |
| 1 |  |  |  |
|  | 40.9/0.63, 0.819 | 24.5/0.52, 0.790 | 29.8/0.53, 0.662 |
| 5 |  |  |  |
|  | 47.0/0.65, 0.979 | 39.0/0.738, 0.925 | 40.1/0.69, 0.917 |
| 10 |  |  |  |
|  | 50.0/0.75, 0.986 | 38.1/0.71, 0.819 | 26.8/0.56, 0.675 |

**Table S4. ATVS-activated protocol (C): CTDIvol versus NI in CTA, BONE, C+, and C- clinical modes, fitting (aM/bM, R2)parameters across phantoms and anatomical regions, P<0.001.**

|  |  |
| --- | --- |
|  | aΤ/bΤ, R2 |
|  | Head | Thorax | Abdomen/Pelvis |
| Age (y) | CTA |
| Neonate |  |  |  |
|  | 562.8/2.02, 1 | 182.15/2.01, 0.999 | 180.1/2.02, 1 |
| 1 |  |  |  |
|  | 923.5/2.01, 0.999 | 104.19/1.99, 0.999 | 125.1/2.00, 1 |
| 5 |  |  |  |
|  | 9783.7/2.87, 0.961 | 1435.6/2.93, 0.999 | 1783/2.87, 0.970 |
| 10 |  |  |  |
|  | 9777/3.13, 0.970 | 3498/3.09, 0.964 | 203.2/1.73, 0.997 |
|  | BONE |
| Neonate |  |  |  |
|  | 623.0/2.01, 0.999 | 199.4/2.00, 0.999 | 202.8/2.01, 0.999 |
| 1 |  |  |  |
|  | 1080.8/2.02, 0.999 | 122.22/2.007, 0.999 | 146.5/2.01, 1 |
| 5 |  |  |  |
|  | 6669.3/2.671, 0.976 | 1004.4/2.74, 0.974 | 1231/2.68, 0.977 |
| 10 |  |  |  |
|  | 6017/2.88, 0.971 | 1966/2.81, 0.967 | 593/2.32, 0.971 |
|  | C+ |
| Neonate |  |  |  |
|  | 744.1/2.02, 1 | 238.4/2.00, 0.999 | 239.3/-2.01, 0.999 |
| 1 |  |  |  |
|  | 2097.9/2.22, 0.988 | 272.3/2.256, 0.999 | 301/2.23, 0.987 |
| 5 |  |  |  |
|  | 11040/2.79, 0.988 | 1640.9/2.863, 0.984 | 1640/2.72, 0.989 |
| 10 |  |  |  |
|  | 3805/2.64, 0.985 | 1360/2.60, 0.983 | 461/2.15, 0.984 |
|  |  |  |  |
|  |  | C- |  |
| Neonate |  |  |  |
|  | 956.7/2.021, 1 | 304.3/2.00, 0.999 | 295.0/2.00, 1 |
| 1 |  |  |  |
|  | 1723.2/2.045, 0.999 | 235.4/2.10, 0.999 | 249.6/2.06. 0.999 |
| 5 |  |  |  |
|  | 3185.4/2.231, 0.995 | 404.6/2.23, 0.996 | 401/2.09, 0.998 |
| 10 |  |  |  |
|  | 1796/2.27, 0.993 | 576/2.19, 0.997 | 4091/2.98, 0.968 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |