Signal to Noise Variability of Phased Array Coil Elements Used in a Radiation Oncology Dedicated MRI Simulator

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Purpose

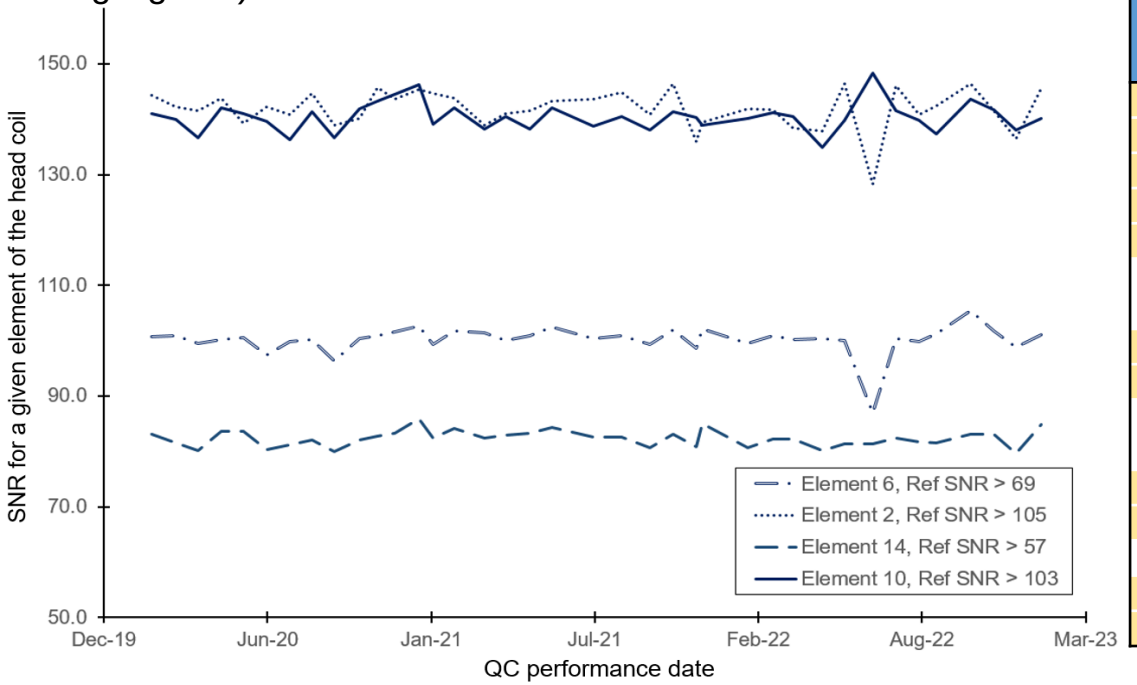
- Radiofrequency coil quality control (QC) recommendations range from monthly to quarterly or annual evaluations
- In this work, monthly analysis of signal-to-noise ratio (SNR) was carried out for all elements of our phased array coils

Materials & Methods

- QC testing of 5 phased array coils (head coil, head and neck coil, posterior coil, 2 anterior coils), with ≥12 elements in each coil (a total of 75 elements) was completed
- Data was acquired over 3 years on a monthly basis using a 1.5T MRI simulator (Ingenia, Philips Systems), with phantoms, methodology and analysis from the vendor
- SNR was tabulated for each element and the minimum, mean, standard deviation and coefficient of variation (CV) were computed

Results & Conclusions

- Measured SNR was higher than vendor's specification for all coil elements (figure shows sample data from 4 elements of the head coil, vendor's specification shown as Ref SNR in legend)
- CV was between 1.4% - 7.8%, flexible coils had more elements with CV > 3% compared to rigid coils (63% of elements in flexible coils, 14% of elements in rigid coils) (sample data in tables below, CV>3% highlighted)



Anterior coil element	CV (%)
Element 1	4.0%
Element 2	3.9%
Element 3	4.6%
Element 4	5.1%
Element 5	5.2%
Element 6	2.2%
Element 7	2.5%
Element 8	5.8%
Element 9	5.4%
Element 10	2.0%
Element 11	2.6%
Element 12	5.4%
Element 13	4.9%
Element 14	2.2%
Element 15	7.8%
Element 16	6.0%

Head coil element	CV (%)
Element 1	2.5%
Element 2	2.5%
Element 3	2.0%
Element 4	2.2%
Element 5	2.0%
Element 6	2.7%
Element 7	3.2%
Element 8	3.5%
Element 9	1.5%
Element 10	1.9%
Element 11	1.5%
Element 12	1.4%
Element 13	1.7%
Element 14	1.8%
Element 15	1.5%

- Coil failures were not observed in the data and contributions to SNR fluctuations were not investigated
- The data may justify less frequent testing of the elements of some of our coils that have a low CV, a rigid design and/or less frequent use