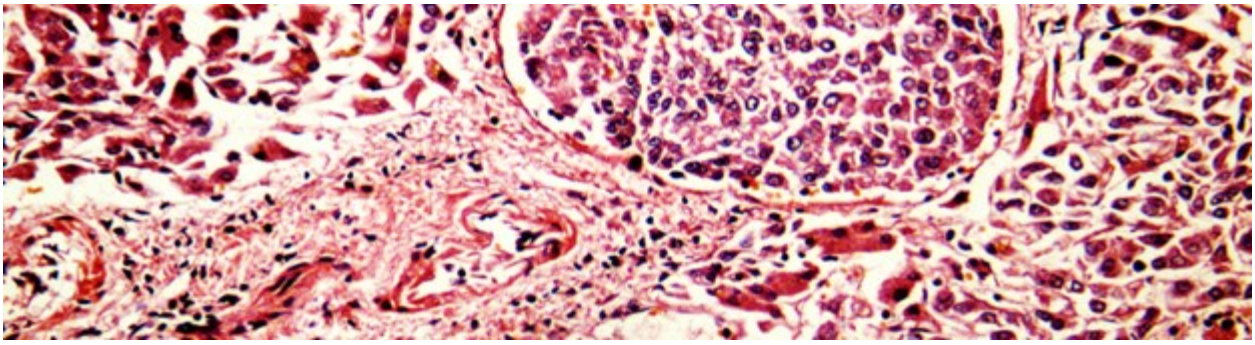
Chemometrics

Application Note



Interpreting Magnetic Resonance Images

Demonstration of the Pirouette® multivariate pattern recognition in cancer image analysis

Summary

The Chemometric/MRI approach is extremely good at categorizing tissue that has been traditionally difficult to differentiate. It allows the radiologist to separate tumor and inflammation and quickly identify like tissue.

The chemometric approach to MRI has been demonstrated in the clinical evaluation market, with the results presented in a peer-reviewed section of the Radiological Society of North America meeting. Examples processed with Pirouette software are drawn from the following applications.

- *Cancer Diagnostics* - Cancerous cells are often difficult to identify from the surrounding tissue. Fat and inflamed, non-cancerous tissue can mask the extent of the cancer.
- *Cancer Staging* - The issue is to identify remote lesions using the magnetic resonance signature of the patient's primary tumor. Isolated tumors are usually treatable by radiation and/or chemotherapy. If the cancer has spread to other organs, the therapy route is not preferred.
- *Cancer Remission* - There is a significant need to chart the effectiveness of chemotherapy or radiation therapy in cancer patients without resorting to further invasive procedures.

If we run the MRI with several magnetic field strengths (in this case 12), we can use chemometrics to classify the tumor area (Figure 1) based on the similarity of spectral response.

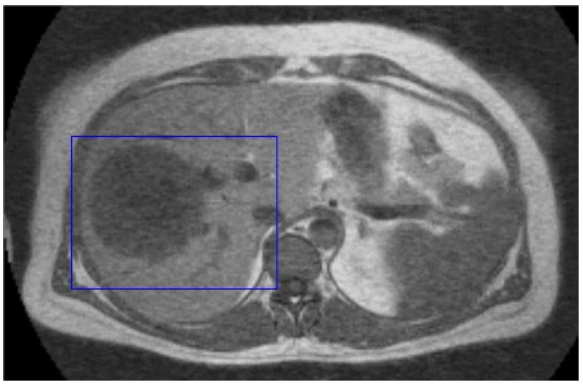


Figure 1.

In Figure 2, the necrotic core (green) of the tumor is differentiated from actively growing cancer (red) and inflamed tissue (violet). You can also see two secondary tumors that may not be obvious from the original MRI.

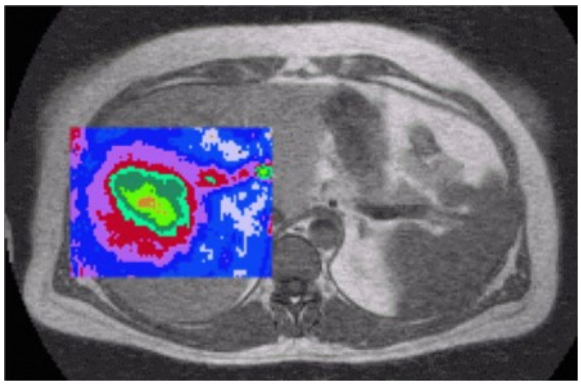


Figure 2.

Examples of both cancer staging and cancer remission are shown in Figures 3 and 4. A known cancer mass (an 11cm plasmacytoma) generates a pattern that is used to identify three smaller plasmacytomas elsewhere in the pelvis.

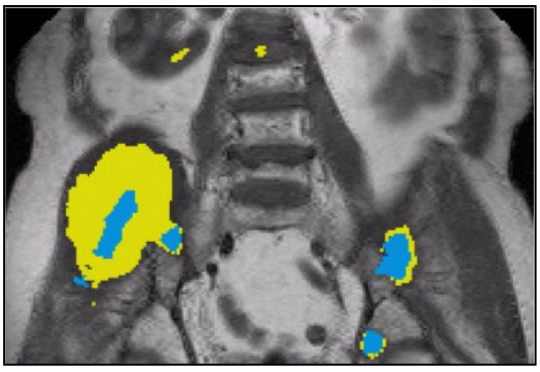


Figure 3.

The picture in Figure 4 shows how the cancer has shrunk 90 days after a bone marrow transplant and is based on the pattern stored in the "before" scan.

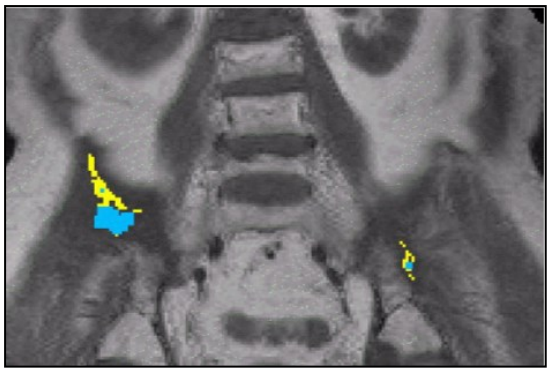


Figure 4.