

Multiparametric MRI of the Prostate Gland

Dr Anthony Lawson, Radiologist

MRI has been used in New Zealand for more than 25 years for the noninvasive assessment of the prostate gland and adjacent pelvic organs. The initial application of MRI centred on local pelvic staging in patients with biopsy proven cancer.

More recent advances in hardware and software have led to the development of multiparametric MRI (mpMRI). The mpMRI technology combines anatomic assessment with functional and physiological assessment that includes diffusion weighted imaging (DWI) and the derivative apparent diffusion coefficient (ADC) maps, and dynamic contrast enhanced (DCE) MRI.

mpMRI has substantially increased the diagnostic capability for the assessment of prostate cancer. Specifically, the detection of clinically significant cancer is improved by mpMRI, and mpMRI provides increased confidence in the diagnosis and management of benign disease and dormant prostatic malignancy. Research has

demonstrated that mpMRI has a high negative predictive value for clinically significant prostate cancer.

The clinical indications for mpMRI include not only locoregional staging of biopsy documented prostate cancer, but also the following applications:

1. Progressive rise in PSA in the context of negative transrectal or transperineal biopsy.
2. Localization of tumour prior to biopsy.
3. Localization of tumour prior to nonoperative therapy.
4. Imaging guidance for targeted biopsy.
5. Adjunct to biopsy and the other clinical parameters that are employed at initial risk stratification prior to the commencement of Active Surveillance of low grade prostate cancer.
6. Monitoring of patients who have low risk disease and are being managed by Active Surveillance.
7. Investigation of posttreatment biochemical failure for the detection of locally recurrent disease.

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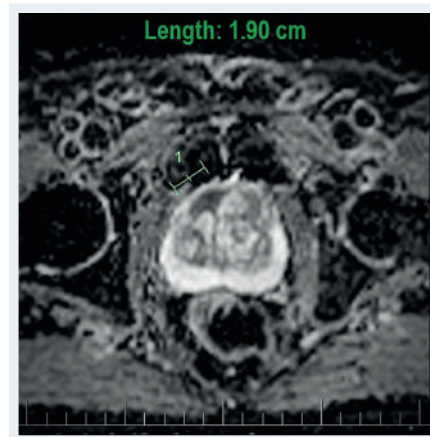
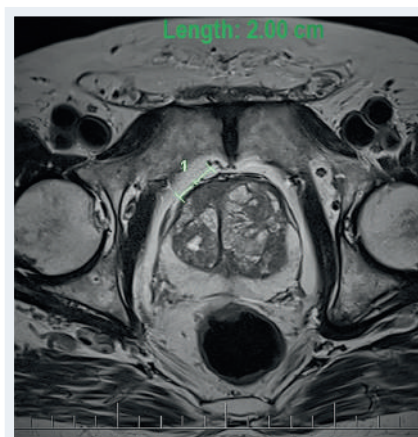
Clinical Cases

Three recent clinical cases that illustrate mpMRI of the prostate gland:

CASE 1

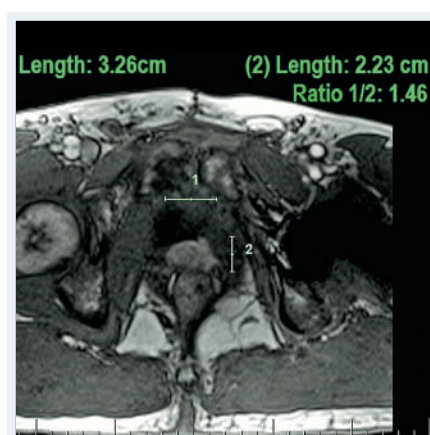
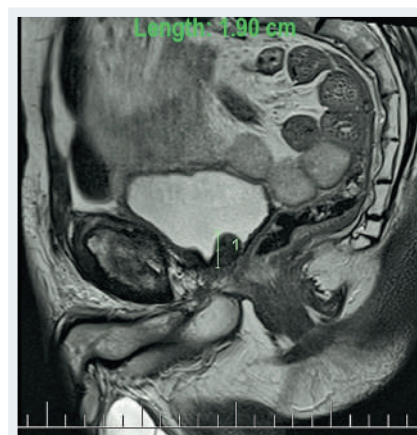
Case 1 illustrates mpMRI that has been performed following transrectal biopsy in the evaluation for possible management of prostate cancer by active surveillance. Despite significant elevation of PSA to 16 the biopsy had yielded tumour with a low Gleason score of 3+3, present as a single focus of malignant cells within the biopsy cores.

mpMRI demonstrates a 20mm lentiform T2 dark mass that shows restricted diffusion (dark) on the ADC map. Clinically significant malignancy is very likely. The initial biopsy had probably failed to sample this significant lesion that is located within the anterior gland.



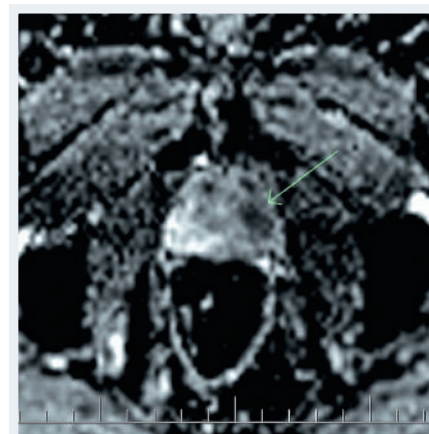
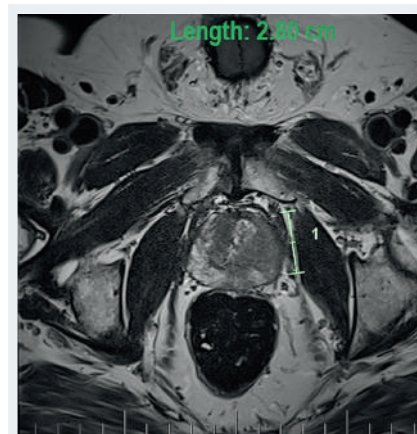
CASE 2

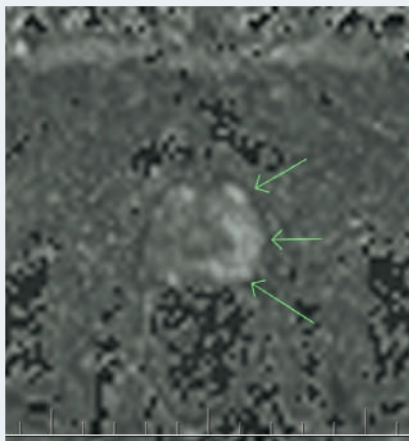
Case 2 demonstrates mpMRI in the investigation of PSA 3.1 at 6 years following radical prostatectomy (i.e. biochemical failure). A lobulated mass of locally recurrent tumour is detected at the cystourethral anastomosis. A key diagnostic feature is early and rapid enhancement (bright) of the abnormal tissue, as has been demonstrated on the dynamic imaging following gadolinium chelate by intravenous bolus.



CASE 3

Case 3 represents mpMRI for the investigation of a progressive rise in PSA from 1.4 to 5.8 in the context of a normal digital rectal examination. A T2 dark mass within the peripheral left lateral part of the gland exhibits both reduced diffusion (dark) on the ADC map and early rapid enhancement (bright). Malignant disease is very likely, and the broad interface with the capsule of the gland indicates a high probability of microscopic extracapsular extension.





REFERENCES

1. Prostate imaging and reporting and data system:
www.acr.org/~media/ACR/Documents/.../PIRADS/PIRADS%20V2.pdf
2. NZ Ministry of Health proposal for prostate cancer management:
<http://www.vision6.com.au/ch/17559/2dfsbl2/2322387/1efcax017.docx>
3. Active surveillance of biopsy proven prostate cancer in New Zealand: Guidance on Using Active Surveillance to Manage Men with ...

Multiparametric MRI of prostate disease is performed by TRG Imaging at the Northern Radiology, the TRG Auckland and the Lakes Radiology practices. mpMRI is performed on a 3 Tesla scanner in Auckland, and on high resolution 1.5 Tesla scanners at the Whangarei and the Rotorua practices.

Sinusitis

Dr Stephen Gock, Radiologist

WHAT ARE THE SINUSES?

The paranasal sinuses are four pairs of air filled cavities within the bones of the face, above and around the eyes and nose, named the maxillary, ethmoid, frontal and sphenoid sinuses. They are connected to the nasal cavity by small openings and are lined by the same mucous membrane that lines the nasal passages and the rest of the respiratory system.

Air passes in and out of the sinuses and mucous produced by the mucous membrane is able to drain into the back of the nasal cavity. Mucous helps to remove dust, bacteria and other air pollutants from the sinuses and nasal cavity.

WHAT IS SINUSITIS?

Sinusitis, also known as sinus infection, inflammatory sinus disease or rhinosinusitis, is the inflammation of the mucosal lining of one or more of the sinuses. The inflammation causes congestion which leads to the build up of pressure causing symptoms such as pain, nasal discharge, post nasal drip, headache, fever, reduced sense of smell and a feeling of fullness of the face.

WHAT CAUSES SINUSITIS?

The inflammation can be caused by infection or allergies. Usually the infection that causes sinusitis is bacterial or viral, although fungal infections can also cause the condition.

Obstructions within the sinuses or nasal cavity such as anatomic variants, deviated septum, nasal polyps or tumours, can lead to sinusitis by preventing the normal drainage of mucous and creating a breeding ground for infection.



Axial view of the maxillary sinuses with normal aeration

WHAT IS THE DIFFERENCE BETWEEN ACUTE AND CHRONIC SINUSITIS?

Acute sinusitis commonly occurs as the result of a cold, a bacterial or viral infection, or allergies. Symptoms may last up to four weeks. There may be repeated occurrences but symptoms are absent in between episodes.

Chronic sinusitis is considered present if a patient has continuous symptoms for more than three months. The sinuses may become narrowed or closed completely due to chronic infection and inflammation. Ongoing allergies and environmental irritants such as cigarette smoke may also be a causative factor.

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Sinusitis

HOW IS SINUSITIS DIAGNOSED?

The diagnosis of sinusitis can be difficult as its symptoms can mimic those of a common cold. In order to make an accurate diagnosis a full medical history is taken including an assessment of the nature and duration of symptoms. A physical examination is performed including looking into the ears, throat and nose.

Imaging of the sinuses is best achieved by a CT examination of the sinuses which allows high resolution cross sectional views of the sinuses in all three planes to be analysed. CT of the sinuses has replaced plain x-rays and the CT miniseries as the investigation of choice and does not require contrast injection.

Chronic sinusitis is demonstrated on CT by mucosal thickening within the sinuses which may obstruct the drainage pathways and extend into the nasal passages as nasal polyps.

Acute sinusitis may be diagnosed on CT if there is fluid within the sinuses forming a dependent level with air above. This can often occur superimposed upon a background of chronic sinusitis.

HOW IS SINUSITIS TREATED?

Antibiotics are used to treat acute bacterial sinusitis. Longer courses may be needed for cases of recurrent or chronic sinusitis. Steroid medications such as prednisone may be prescribed in order to treat cases of chronic sinusitis.

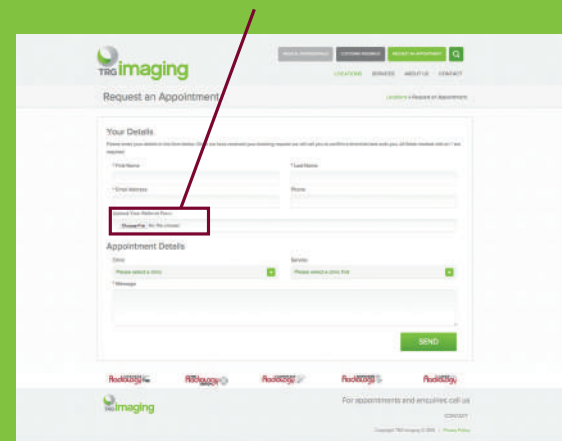
Surgery may be recommended for cases where medical treatment has not been effective or an obstructive lesion has been demonstrated by CT. Functional endoscopic sinus surgery (FESS) aims to improve airflow and drainage between the sinuses and the nasal cavity by correcting structural abnormalities such as a deviated septum, removing obstructions such as polyps and by removing areas of diseased tissue.

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From our website www.trgimaging.co.nz, you can request an appointment by clicking on the button **REQUEST AN APPOINTMENT**

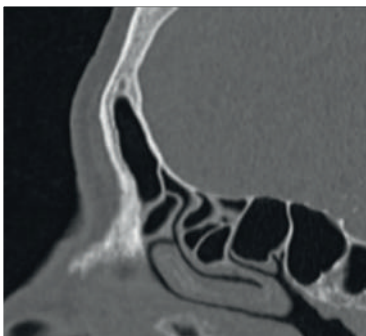


Once selected, an electronic form will open that requires some details about the patient and appointment. The form is also designed to now accept scanned or electronic forms as an attachment.

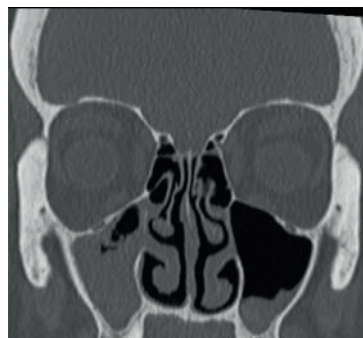


After the form is submitted, a booking person will contact the patient for an appointment.

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Sagittal view of the frontal, ethmoid and sphenoid sinuses with normal aeration



Coronal view of the maxillary sinuses with moderate chronic sinusitis



Coronal view of the maxillary and ethmoid sinuses with severe chronic sinusitis and nasal polyps

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