Multiple Sclerosis
Counseling Points™
Enhancing Patient Communication for the MS Nurse

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Magnetic Resonance Imaging (MRI) in MS

A Roundtable Discussion

Magnetic resonance imaging (MRI) is a technology that allows clinicians to tailor the imaging study to the anatomic part of interest and to the disease process being studied.

MRI differs from computerized tomography (CT) in that MRI images do not use potentially harmful ionizing radiation.[1] In addition, MRI images provide greater contrast than those obtained with standard x-rays, CT, or ultrasound. Thus, MRI is able to distinguish fine variations in tissues deep within the body.[1]

In 2003, there were approximately 10,000 MRI units worldwide, and approximately 75 million MRI scans per year performed.[2] MRI is now a major component of multiple sclerosis (MS) diagnosis and is used extensively in clinical trials as a primary or secondary endpoint, or as a surrogate marker for clinical endpoints. Although it provides useful information about the effects of MS on a patient's brain and spinal cord as the disease progresses, MRI should only be employed as an adjunct to clinical findings in ongoing patient monitoring and disease management.

Principles of MRI

MRI uses magnetic fields and radio waves to provide detailed images of the human body. The MRI scanner is basically a large cylindrical, hollow magnet in which the

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Welcome to MS Counseling Points™

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Dear Colleague,

If you've seen a patient with multiple sclerosis (MS) in recent years, chances are that patient came armed with a sheaf of magnetic resonance imaging (MRI) scans. Unless you're an expert in MS or radiology, you probably have little idea what the scans actually show and their implications for the patient.

In this issue of *Counseling Points™* we endeavor to demystify MRI, providing you with a basic understanding of how MRI works, what scans show, and how they can be used to aid in the diagnosis of MS, as an adjunct to clinical evaluation in monitoring disease progression, and as a surrogate marker for clinical endpoints in trials.

The important thing to remember is that, although MRIs provide valuable information, they are not a substitute for clinical diagnosis and monitoring. As the experts note in this issue, we don't treat the MRI, we treat the patient.

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patient is positioned. The magnetic field strength of the magnets used for MRI is measured in units called Tesla.[3] One Tesla is equal to 10,000 Gauss. Given that the magnetic field of the earth is approximately 0.5 Gauss, a 1.0 Tesla magnet has a magnetic field roughly 20,000 times stronger than that of the earth.[3] MRI scanners in clinical use in MS range from 1 to 3 Tesla in strength. However, there are MRI machines of greater Tesla being used in clinical research. MRI scanners using 8 and 9 Tesla magnets are in limited use in research settings.

The body has large amounts of fat and water. Fat and water contain many hydrogen atoms. The amount of hydrogen in diseased tissue differs from the amount in healthy tissue of the same kind; thus, MRI is particularly effective at identifying tumors and other lesions.[1]

The nucleus of the hydrogen atom contains a single proton, which possesses magnetic properties, known as magnetic moment.[2,4] These protons behave like tiny rotating magnets, represented by vectors.[4] Normally, the direction of these vectors is randomly distributed. However, within a large external magnetic field such as an MRI scanner, nuclear protons align with the external field. Some of the protons align with the field (parallel) and some align against the field (anti-parallel).[4] The parallel protons are low-energy protons, also known as spin-up protons, whereas protons aligned against the field are high-energy protons.[5] Pairs of parallel and anti-parallel protons cancel each other out, leaving only a few unpaired low-energy protons.[5,6]

Protons wobble (or precess) about the axis of the scanner's magnetic field, describing a cone shape, somewhat like a dreidel spinning around its axis.[4] Precession enables protons to emit and absorb radio waves that are detected by the scanner.

Once a patient's hydrogen atoms have been aligned by the magnet, specific radio-wave frequencies are used to knock them back out of alignment.[1] Radio waves are transmitted to the area of interest in the body (in the case of MS, the brain or spinal cord) at a frequency that is specific to hydrogen.[7] Meanwhile, gradient coils quickly switch on and off. This modifies the magnetic field in the brain or spinal cord, allowing "slices" of different thickness to be imaged.[7]

The hydrogen atoms absorb and emit radio-wave energy in turn, vibrating back and forth between their resting (magnetized) state and their agitated (radio pulse) state. This is the "resonance" aspect of MRI.[1]

When the pulse of the radio wave is turned off, the atoms "relax" back into their original positions parallel to the magnetic field, releasing energy in the form of radio signals. The MRI machine then records the duration, strength, and source of these signals and transposes this information into an image on a monitor.[1] The water content and proton density of the tissue being examined influences the intensity of the image generated. Light (or hyperintense) and dark (or hypointense) areas reflect differences in water and proton densities. This creates contrast between tissues. Pathological changes can alter water content, revealing additional areas of hyperintensity or hypointensity on the scan.[7]

T_1- and T_2-weighted Images

You will hear a lot of talk about T_1- and T_2-weighted images. Simply put, "T" relates to relaxation time. Relaxation is the transfer of energy from excited protons to either the surrounding environment or nearby nuclei.[7] T_1 represents the decay in magnetization as energy is transferred from excited protons to the surrounding environment. T_1 relaxation time is specific to water. Thus, T_1 is longer in tissues with higher volumes of water. Because there is more water in white matter of the brain than gray matter, looking at T_1-weighted images provides a contrast between these two tissues **(Figure 1).**[7]

T_2 relaxation time represents the decay in magnetization when energy is transferred from excited protons to the spin-adjacent protons. T_2 is tissue-specific and is always shorter than T_1.[4]

When looking at brain MRIs, T_1 and T_2 relaxation times are the major determinants of signal intensity and contrast. The contrast

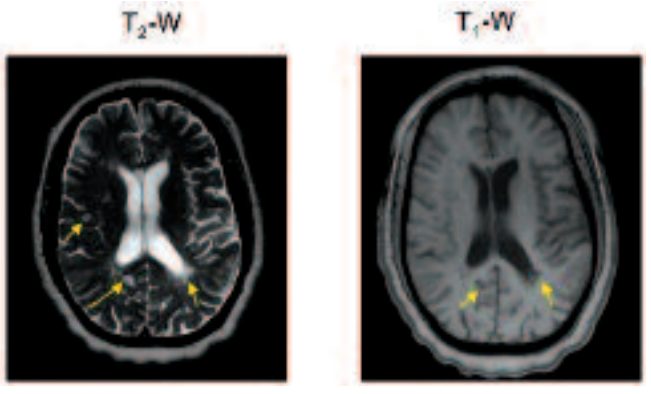

Figure 1. Multiple sclerosis lesions appear bright on T_2-weighted images due to the abnormal increase in water content. Some of the T_2-visible lesions appear dark on the corresponding T_1-weighted images (arrows).

Image courtesy of *Matilde Inglese, MD, PhD.*

is distinctly different on T_1- and T_2-weighted images.[8]

Fluid-attenuated inversion recovery (FLAIR) is an advanced MRI sequence that reveals tissue T_2 prolongation with cerebrospinal fluid suppression, allowing detection of periventricular and juxtacortical lesions in the vicinity of cerebrospinal fluid (CSF).[9]

Contrast Agents

Contrast agents are often used to improve the signal contrast on MRI scans.[7] These agents affect signal intensity by altering relaxation times of water protons in nearby tissues. Gadolinium (Gd), a metallic agent with strong paramagnetic properties, is frequently used on T_1-weighted images because it shortens T_1, resulting in enhancement of signals. This produces hyperintense areas on the images.[7]

The MRI Procedure

During an MRI, a patient lies on a narrow table that moves into a long tube-like structure that houses the magnet. Once the patient has been positioned in the tube so that the area of interest can be examined, a radio pulse is applied and an image created. The table then moves a fraction of an inch and the next image is created. This continues until all the required images are collected. The process can take from 30 to 90 minutes.

A patient can feel quite claustrophobic within the tube. Thus, in some cases, physicians prescribe an anti-anxiety medication before the procedure. For particularly claustrophobic patients, an open-MRI machine is often used. In this situation, the magnet is two opposed halves with a large space in-between. However, because the the field strength of the magnets is lower (usually 0.2–0.5 Tesla) than with standard full-strength machines, it can take longer to acquire images and the images may not have as good quality. Therefore, it is recommended that MRIs in patients with MS be performed in standard MRI machines wherever possible. Recently higher-field open MRI machines (up to 1.5 Tesla) have been being introduced that will likely increase the quality of imaging in claustrophobic patients.

Application to MS

Common Techniques

As you are probably aware, MS is characterized by demyelinated lesions or plaques seen in the brain and spinal cord.

Table 1. Tissue Appearance on MRI[7]

	T_1	T_2	Gd-enhanced
Bone	Dark	Dark	Dark
Fat	Bright	Bright	Bright
CSF	Dark	Bright	Dark
Ventricles	Dark	Bright	Dark
Gray matter	Darker	Lighter	Darker
White matter	Lighter	Darker	Lighter
Active lesions	Dark	Bright	Bright; ring
Inactive lesions	Dark	Bright	Dark

CSF=cerebrospinal fluid; Gd=gadolinium.

These lesions represent scar tissue following destruction of myelin. In addition, a feature of MS is damage to and, in some cases, loss of axons. T_2-weighted and T_1-weighted images with or without Gd enhancement are the standard techniques used to image MS lesions.[10] Depending on which technique is used, lesions appear either hyperintense (bright) or hypointense (dark) on scans of particular tissues **(Table 1).**[7]

In some situations, lesions located in the periventricular regions may be difficult to distinguish from CSF on conventional T_2-weighted scans.[7] In this situation, using images that examine proton density can help produce improved lesion-to-CSF contrast. This is achieved by altering the pulse sequence to produce a proton-density-weighted scan.

MRI as an Aid to Diagnosis

No single test is 100% reliable in diagnosing MS, and a number of conditions can mimic MS. Thus, diagnosis is primarily clinical, depending on the presence of typical signs and symptoms. However, certain tests, such as MRI, evoked potentials, and CSF analysis can be of use in confirming the diagnosis.[14]

Diagnostic criteria, known as the McDonald Criteria, were introduced in 2001 to enhance the ability of the neurologist to diagnose MS as well as balance the need for early diagnosis with the need to avoid false-positive results. Since then, the MRI component of these criteria has been modified to:

- reflect the importance of the dissemination in time (DIT) of lesions;
- clarify the use of spinal cord lesions in diagnosis;
- simplify the diagnosis of primary-progressive disease.[15]

The guidelines emphasize that MRI is only to be used to supplement rather than replace clinical evidence derived from a detailed history and neurological examination. The revised MRI criteria to demonstrate brain abnormality and demonstrate dissemination of lesions in space (DIS) and time (DIT) are as follows:

- ≥2 attacks with objective clinical evidence of at least 2 lesions
- ≥2 attacks with objective clinical evidence of 1 lesion + DIS shown on MRI or ≥2 MRI lesions consistent with MS + positive CSF finding or second clinical attack
- 1 attack with objective clinical evidence of ≥2 lesions + DIT on MRI or second clinical attack
- 1 attack with objective clinical evidence of 1 lesion + DIS shown on MRI or ≥2 MRI lesions consistent with MS + positive CSF finding and DIT shown on MRI or second clinical attack
- Insidious neurologic progression suggestive of MS + 1 year of disease progression determined retrospectively or prospectively and 2 of the following: positive brain MRI result (9 T_2 lesions or at least 4 T_2 lesions with positive VEP), positive spinal cord MRI result with 2 focal T_2 lesions, and positive CSF findings.[15]

Lesion Evolution and Disease Monitoring

New MS lesions almost always appear as nodular areas of Gd-enhancement on T_1-weighted images on conventional MRI **(Figure 2)**.[16] In most cases, hyperintense lesions in the same location are visualized on T_2-weighted images.[16] Almost two-thirds of larger enhancements are associated with hypointense lesions noted on non-contrast T_1-weighted images.[17]

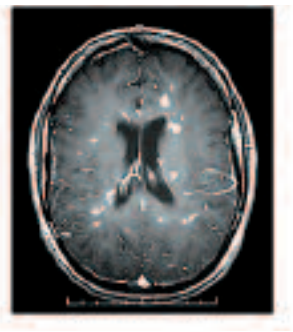

Figure 2. A T_1 image with gadolinium enhancement demonstrates breakdown of the blood-brain barrier and areas of active inflammation.

Image courtesy of *Matilde Inglese, MD, PhD.*

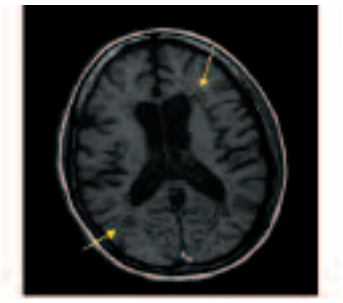

Figure 3. Lesions that are dark on T_1-weighted images may be temporary or permanent. Temporary hypointensities are associated with edema. Permanent hypointensities or "black holes" are considered areas of severe demyelination and axonal loss.

Image courtesy of *Matilde Inglese, MD, PhD.*

In most cases, enhancements tend to fade and even disappear altogether over 4 to 6 weeks, whereas around half of the hypointensities resolve within 4 weeks. A similar proportion of lesions found at 1 month disappear over the next 4 to 5 months.[17] Compared with enhancements, T_1 hypotensities are more common with longer disease duration.

Most T_2 hyperintensities do not disappear.[17] A subset of lesions visualized on T_2 images may appear hypointense on corresponding T_1 images. These T_1 hypointense regions are known as "black holes" **(Figure 3)**.[17] Approximately 40% of new MS lesions evolve into black holes that persist over the short term.[16] Chronic black holes are T_1 hypointense lesions that persist for 6 months or more.[18] These may indicate irreversible tissue damage.[18]

A common feature of MS is progressive brain and spinal cord atrophy. This may begin relatively early in the disease course.[19] Brain atrophy is measured as a reduction in volume of brain white or gray matter, expressed as percent brain volume change. It is indicative of demyelination and axonal loss and is strongly associated with disability as well as declines in quality of life and cognition.[20-22]

Brain atrophy can be measured by MRI scans by calculating the volume of the ventricles and subarachnoid spaces (which are often enlarged in MS) and other brain structures, the size of which may be reduced.[7]

Use of MRI in Clinical Trials

Conventional MRI measures are used extensively as secondary endpoints in clinical trials. Recently, they have also gained some acceptance as surrogate markers for clinical endpoints (i.e., relapse rates, disability progression, etc.).

A Word about Gadolinium

In the last year or so, there has been some new information regarding the use of gadolinium (Gd)-based contrast agents in magnetic resonance imaging (MRI).[11,12] Researchers have found that, among patients with renal disease, these agents may lead to the development of nephrogenic systemic fibrosis (NSF).[12] Signs of NSF include swelling and skin tightening over a period of days to weeks, which, in severe cases, may affect the ability to walk. NSF can also affect the liver, lungs, muscles, and heart. In 5% of cases, it progresses rapidly and increases the mortality risk from comorbid conditions.[12]

In response to these reports, the Food and Drug Administration has placed a black-box warning in the product information of Gd-based contrast agents.[13] This warning notes that patients at risk for NSF are those with acute or chronic severe renal insufficiency (glomerular filtration rate <30 mL/min/1.73m^2) and acute renal dysfunction due to the hepato-renal syndrome or in the perioperative liver transplantation period.[13]

The bottom line for MS clinicians is that all patients who are to undergo Gd-enhanced MRI should be screened for renal dysfunction. Patients who are at risk for NSF should be informed of the possibility of developing this condition and that it is a potentially fatal disease.[13]

The measures most frequently used in clinical trials include:

- Change in number of lesions
- Change in lesion area
- Change in lesion volume
- Annual rate of active lesions
- Proportion of patients remaining free from new lesions.[7]

Using MRI to Make Treatment Decisions

Many clinicians initiate disease-modifying therapy (DMT) for a CIS based on clinical evidence and a single MRI without waiting for evidence of DIT.[23] Given the widely held view that early treatment is desirable, the reliance on MRI findings as an adjunct to clinical evaluation is acceptable in this situation.

However, more and more frequently, some clinicians are relying on the MRI to guide ongoing treatment decisions. If a routine MRI reveals one or two new Gd-enhancing lesions, some clinicians and patients become concerned that the current DMT is no longer working, despite the lack of any clinical evidence. It is an important part of the nurse's job to educate patients about the role of MRI in treatment decisions, emphasizing that before therapy changes are made, we need to look at the whole picture. In recognition of the need for reliable and clinically employable criteria to assess individual patients' responses to DMT, a group of neurologists met in 2004 and developed a consensus statement on factors constituting a suboptimal response.[24]

These physicians suggested that particular attention should be paid to a combination of factors: clinical status (history of relapses and physical examination); subjective impressions of the patient and physician (e.g., diminished function not necessarily reflected by altered examination findings); and MRI indicators of continuing disease activity. In all instances, however, clinicians should remember that we are not treating the MRI results, but rather the patient.

Emerging Techniques

Although conventional MRI techniques have been used successfully as an adjunct to diagnosis and to assess the efficacy of investigational drugs, they provide inadequate estimates of the extent, nature, and progression of disease. This is because they are not specific to MS-related pathological processes and are not sensitive to abnormalities in normal-appearing brain tissue.[25,26]

Newer more sensitive techniques, as outlined below, are under investigation. Although these techniques have been used in clinical trials, they are not generally used to evaluate MS outside academic settings.

MRS

Magnetic resonance spectroscopy (MRS) provides information about the chemical composition of the brain and the changes in chemical composition that may occur with disease processes. With regard to MS, MRS provides quantifiable information about inflammatory demyelination and axonal injury.[7]

In simple terms, the technique involves measuring shifts in resonance frequencies of various chemicals within the brain. The chemical of interest with regard to MS is N-acetyl aspartate (NAA). Shifts in NAA levels are measured relative to an arbitrary reference compound; in the case of the brain, the reference compound is creatine and NAA is a marker of neuronal integrity.[27] Reduced levels of NAA are indicative of axonal and neuronal injury and irreversible axonal loss.[19]

Revised MRI Criteria Studied

Recently, new MRI criteria for MS diagnosis have been introduced by Swanton et al. Compared with the McDonald 2001 and 2005 criteria, these criteria loosen the definitions of dissemination in space (DIS) of lesions to include at least one T_2 lesion in at least two of the four neurological regions considered characteristic for demyelination. The Swanton criteria also call for dissemination in time (DIT) of lesions to be defined as a new T_2 lesion on a follow-up MRI scan, irrespective of the time since baseline. The authors compared these modified guidelines to McDonald's criteria in predicting the risk of conversion from clinically isolated syndrome (CIS) to clinically definite multiple sclerosis (CDMS) in a cohort of approximately 500 patients who had two MRI scans within 12 months of CIS onset.

The specificity for the new set of criteria was nearly as high as for the previous versions of the McDonald 2001 and 2005 criteria: 87% vs. 91% and 88%, respectively. The Swanton criteria showed a superior sensitivity (72%) compared with the McDonald 2001 (47%) and McDonald 2005 (60%) criteria. Patients had a higher risk of conversion across all three criteria if both DIS and DIT were evident on two MRI scans rather than either DIS or DIT alone, according to Cox proportional hazards model analysis. Only the new criteria had an independent significant effect on conversion risk.

The new criteria appear to be simpler to comprehend and easier to use than the previous McDonald criteria, while still demonstrating a high degree of specificity and accuracy. The new criteria also allow for diagnosis without the use of Gd-enhanced MRI.

Swanton JK, Rovira A, Tintore M, et al. MRI criteria for multiple sclerosis in patients presenting with clinically isolated syndromes: A multicentre retrospective study. *Lancet Neurol.* 2007;6:677-686.

MTI

Magnetization transfer imaging (MTI) is a sensitive marker of occult MS-related brain damage.[28] It is used to identify and quantify structural changes associated with MS lesions and in normal-appearing brain tissue.[7] A low magnetization transfer ratio (MTR) reflects a reduction in the capacity of central nervous system (CNS) macromolecules to exchange magnetization with surrounding water molecules, indicating damage to myelin or the axonal membrane.[28]

DWI

Diffusion-weighted imaging (DWI) allows investigators to measure the diffusional motion of water molecules, resulting in the ability to gather information about the orientation, size, and geometry of brain structures.[29] Pathologic processes that affect tissue integrity can result in an increased diffusion coefficient. In patients with MS, the diffusion coefficient is higher in macroscopic lesions than in normal-appearing white matter.[29]

The BECOME Trial

Recently, the results of the first randomized prospective clinical trial to compare the effects on primary MRI endpoints of interferon β-1b and glatiramer acetate were presented. BECOME (Betaseron [IFN β-1b) vs. Copaxone [glatiramer acetate (GA)] in MS with triple-dose gadolinium and 3-T MRI Endpoints) studied 75 treated patients with monthly 3-Tesla brain MRI for up to 24 months.[30] The number of combined active lesions (CAL) per scan was the study's primary outcome and was defined as the mean number of enhancing lesions per patient plus the number of new T_2/FLAIR lesions not associated with enhancement.

The intention-to-treat analysis showed that the median CAL per patient per scan over 2 years was 0.78 with IFN β-1b and 0.56 with GA (P=0.38).30 One secondary outcome, CAL per month, was closely related to the primary outcome (differing only because scans could not be obtained monthly in all patients during the second year) and showed no significant difference between the IFN β-1b and GA groups: median CAL was 0.60 vs. 0.38, respectively (P=NS). There were no significant differences between the two groups in another secondary outcome, the number of new enhancing lesions per scan: 0.40 for IFN β-1b and 0.29 for GA (P=NS).[31] The researchers stated that these findings imply that previous research that suggested IFN β-1b superiority over GA in reducing blood-brain barrier breakdown is overstated.

Analysis of several secondary clinical outcomes demonstrated no significant differences between IFN β-1b and GA

Table 2. CMSC Guidelines for a Standardized MRI Protocol for MS[33]

Item	Criteria
Initial evaluation after a CIS or based on past history that is suspicious	• When available, an MRI study that meets standardized protocol should be acquired
Baseline MRI evaluation	• For a patient who already has a diagnosis of MS, it is appropriate that baseline evaluation include an MRI that meets standardized protocol. This is in addition to complete neurologic history and examination
Indications for spinal MRI	• If main presenting symptoms are at level of spinal cord, and have not resolved, spinal cord MRI and brain MRI are required • If results of brain MRI are equivocal and diagnosis of MS is still being entertained, spinal cord imaging may be justified
Follow-up MRI	• In absence of clinical indications, routine follow-up MRI scans are not recommended, regardless of whether patient is being treated • Clinical indications for follow-up MRI are: - Clinical worsening or when physician is concerned about disease course - Reassessment of disease burden for initiation of treatment - Suspicion of secondary diagnosis
Contrast-enhanced MRI	• Recommended for suspected MS for purposes of diagnosis and initial diagnostic evaluation
Acquisition standards	• MRI should be performed, if possible, at >1Tesla to optimize image quality and contrast

CIS=clinically isolated syndrome; MRI=magnetic resonance imaging; MS=multiple sclerosis.

with respect to relapses, physical disability, or cognitive changes. These data were collected only to assist in the interpretation of the brain MRI findings, as the BECOME trial was not statistically powered to distinguish between the two therapies from a clinical standpoint.[31]

It should be pointed out that this trial employed triple-dose Gd, 40 minutes delayed imaging of contrast enhancement, fat saturation pulses, and a 3-Tesla MRI magnet, all of which significantly increase MRI scan sensitivity for detection of blood-brain-barrier breakdown. With the use of monthly imaging, the researchers found that the majority of new brain lesions (98%) did show enhancement at onset. Further evidence of the increased sensitivity of the BECOME MRI protocol was that 70% of patients enrolled in the study showed enhancing lesions at screening or baseline. Analysis of CAL over time for the 75 patients revealed that only about 20% went into complete remission while 20% continued to have active disease nearly all the time. The majority of patients, about 60%, had periods of active disease alternating with periods of remission.[32]

Consortium of Multiple Sclerosis Centers MRI Consensus Guidelines

The Consortium of Multiple Sclerosis Centers (CMSC) is the preeminent professional organization for MS health care providers and researchers in North America, and a valued partner in the global MS community. The core purpose of this non-profit organization is to maximize the ability of MS health care professionals

to enhance the care of people who are affected by MS, thus improving their quality of life.

Following the publication of the McDonald criteria for the diagnosis of MS, CMSC saw the need for a standardized protocol on how MRI should be used for patients with MS or those suspected of having MS.[33] A panel of experts, sponsored by CMSC, developed and published a series of recommendations as summarized in **Table 2**.

Conclusions

MRI continues to play an important role in contributing to our understanding of MS. Its routine use as an adjunct to diagnosis means that patients are now diagnosed more rapidly and thus have earlier access to DMTs that can help slow disease progression.

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MS Counseling Points™

Magnetic Resonance Imaging (MRI) in MS

- Magnetic resonance imaging (MRI) differs from computerized tomography (CT) in that MRI images do not use potentially harmful ionizing radiation and provide greater contrast.
- MRI is now a major component of multiple sclerosis (MS) diagnosis and is used extensively in clinical trials as a primary or secondary endpoint, or as a surrogate marker for clinical endpoints.
- When used for diagnosis, MRI findings should only supplement rather than replace clinical evidence derived from a detailed history and neurological examination.
- MRI should also only be employed as an adjunct to clinical findings in ongoing patient monitoring and disease management.
- The magnetic field strength of the magnets used for MRI is measured in units called Tesla.
- T_2-weighted and T_1-weighted images with or without gadolinium (Gd) enhancement are the standard techniques used to image MS lesions.
- New MS lesions almost always appear as nodular areas of Gd-enhancement on T_1-weighted images on conventional MRI. In most cases, hyperintense lesions in the same location are visualized on T_2-weighted images.
- T_1 enhancements tend to fade and even disappear altogether over 4 to 6 weeks.
- Most T_2 hyperintensities do not disappear.
- All patients who are to undergo Gd-enhanced MRI should be screened for renal dysfunction.
- The MRI process can take from 30 to 90 minutes.
- If patients feel claustrophobic, anti-anxiety medication can be offered prior to MRI scanning or higher strength (1.5 Tesla) open MRI used.

MS Counseling Points™

Magnetic Resonance Imaging (MRI) in MS

Tell Us What You Think

We are anxious to hear your comments about this issue of *Counseling Points™*. We would also like you to share any suggestions you may have for future issues.

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How would you rate the:

Overall quality of *Counseling Points™* ⑤ ④ ③ ② ①

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Usefulness of the information presented in *Counseling Points™* ⑤ ④ ③ ② ①

Value of the *Counseling Points™* summary (page 10) ⑤ ④ ③ ② ①

Do you believe you will be better able to communicate with patients after having read the information presented in *Counseling Points™*?

❑ Yes ❑ No

We would appreciate your comments and suggestions on how we can improve future issues of *Counseling Points™*.

What future topics would you like to see addressed in *Counseling Points™*?

Are there any other comments, suggestions, or thoughts about *Counseling Points™* that you would like to share?

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