6. Park JW, Chen M, Colombo M, et al. Global patterns of hepatocellular carcinoma management from diagnosis to death: the BRIDGE study. Liver Int 2015;35(9):2155–2166.

MR Imaging of Perianal Crohn Disease: The Role of Contrast-enhanced Sequences

From
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Editor:

We read with interest the review by Dr Sheedy and colleagues in the March 2017 issue of *Radiology* (1), as it summarizes magnetic resonance (MR) imaging of perianal Crohn disease (CD) from tip to toe in a brilliant educational form.

The MR imaging protocol described by the authors includes contrast-enhanced T1-weighted imaging with fat saturation in all patients except those with poor renal function. Horsthuis et al (2) demonstrated in 2009 the usefulness of contrast-enhanced MR imaging for determining disease activity. Contrast agent administration is also required in case of suspicion of neoplastic tissue complicating fistulas. The joint European Crohn's and Colitis Organisation–European Society of Gastointestinal and Abdominal Radiology guidelines (3) report that T2-weighted images and contrast-enhanced T1-weighted images are included in the MR imaging protocol for the evaluation of perianal CD.

However, as we have demonstrated (4), an axial T2-weighted fast spin-echo sequence with fat saturation, in particular the short inversion time inversion-recovery (STIR) sequence, is a valid alternative to postcontrast T1-weighted fat-saturated imaging, allowing the identification of the primary fistula and any secondary ramification.

Moreover, the Van Assche classification (5), also reported by Dr Sheedy and colleagues, does not take into account the contrast enhancement for grading disease activity. It has also been demonstrated that disappearance of T2 hyperintensity correlates with the clinical benefit of maintenance antitumor necrosis factor α therapy (6).

Dr Sheedy and colleagues (1) state that figure 4 demonstrates the "benefit of gadolinium-based contrast material in perianal imaging," showing that the contrast agent demonstrates only enhancing granulation tissue within the fistula. However, the granulation tissue can also be demonstrated for its hyperintensity on T2-weighted images, and its reduction is demonstrated by the loss of this hyperintensity, so that, as also stated by Dr Sheedy and colleagues, loss of gadolinium enhancement generally parallels loss of T2 signal intensity during healing.

Considering the costs and the recently reported potential risks of some gadolinium-based contrast agents (GBCAs) (7,8), we believe that intravenous injection of a GBCA could be performed in the first MR imaging assessment of perianal CD or in case of doubts in the precontrast sequences. However, the definitive role of GBCA injection in perianal CD must be clarified with further studies to fully understand the clinical-radiologic settings requiring its administration.

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References

1. Sheedy SP, Bruining DH, Dozois EJ, Faubion WA, Fletcher JG. MR imaging of perianal Crohn disease. Radiology 2017;282(3):628–645.
2. Horsthuis K, Lavini C, Bipat S, Stokkers PC, Stoker J. Perianal Crohn disease: evaluation of dynamic contrast-enhanced MR imaging as an indicator of disease activity. Radiology 2009;251(2):380–387.
3. Panes J, Bouhnik Y, Reinisch W, et al. Imaging techniques for assessment of inflammatory bowel disease: joint ECCO and ESGAR evidence-based consensus guidelines. J Crohns Colitis 2013;7(7):556–585.
4. Lo Re G, Tudisca C, Vernuccio F, et al. MR imaging of perianal fistulas in Crohn's disease: sensitivity and specificity of STIR sequences. Radiol Med 2016;121(4):243–251. Erratum in: Radiol Med 2016;121(4):252.
5. Van Assche G, Vanbeckevoort D, Bielen D, et al. Magnetic resonance imaging of the effects of infliximab on perianal fistulizing Crohn's disease. Am J Gastroenterol 2003;98(2):332–339.
6. Savoye-Collet C, Savoye G, Koning E, Dacher JN, Lerebours E. Fistulizing perianal Crohn's disease: contrast-enhanced magnetic resonance imaging assessment at 1 year on maintenance anti-TNF-alpha therapy. Inflamm Bowel Dis 2011;17(8):1751–1758.
7. Quattrocchi CC, van der Molen AJ. Gadolinium retention in the body and brain: is it time for an international joint research effort? Radiology 2017;282(1):12–16.
8. PRAC concludes assessment of gadolinium agents used in body scans and recommends regulatory actions, including suspension for some marketing authorisations. http://www.ema.europa.eu/ema/index.jsp?curl=pages/news_and_events/news/2017/03/news_detail_002708.jsp&mid=WC0b01ac058004d5c1 Published March 10, 2017. Accessed March 27, 2017.

Response

From
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We thank Dr Vernuccio and colleagues for their interest in our study. Because of its morbidity and high relapse rates, substantial efforts to treat patients with perianal CD are warranted (1–3). Our belief in improved interdisciplinary understanding of advances in imaging and surgical and medical treatment motivated our review (4).

We are aware of the recent controversy regarding gadolinium retention (5), especially with the use of linear as opposed to macrocyclic GBCAs, and appreciate your highlighting this issue in patients with perianal CD, who are likely to undergo repeat imaging.

We appreciate their important report (6), which concludes that the STIR sequence is a valid alternative to postcontrast T1-weighted fat-saturated imaging, allowing the identification of the primary fistula and any secondary ramification. We agree that fistula characterization can be carried out with T2-weighted sequences alone and that healing fistulas decrease in T2 hyperintensity (as well as size and complexity). As they acknowledge, their small study may be underpowered to address the potential miss rate of small undrained abscesses, but, importantly, they found that STIR imaging helped identify nine of nine abscesses. Because "postcontrast T1-weighted images are used for identifying abscesses" (4), this is the central issue to consider when using GBCAs in these patients (4,7). The detection of small abscesses has profound ramifications for patient care when the patient will be treated only medically (eg, with biologic agents), as antibiotic treatment is mandatory; for surgical patients, much of the benefit in the MR examination itself is identification of abscesses that are surgically occult (8).

With this information—how can we best serve our patients? We advocate for immediate conversion to macrocyclic agents, which appear safer. Further research and confirmation of their findings would be useful, and we intend to add STIR imaging to our routine perianal MR imaging protocol. In patients with suspected fistula, there may be no need to administer GBCAs if no perianal fistula is detected. In patients who have previously undergone imaging, if the primary fistula and its ramifications are all decreasing in size and T2-weighted hyperintensity, the yield of GBCA administration is likely low and it may be reasonable to skip contrast material administration; more research is needed. In other scenarios and routine clinical care, however, we intend to continue to utilize macrocyclic GBCAs until additional evidence and experience is gained, as identification of small abscesses changes clinical management for medical and surgical therapies.

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References

1. Dudukgian H, Abcarian H. Why do we have so much trouble treating anal fistula? World J Gastroenterol 2011;17(28):3292–3296.
2. Maconi G, Gridavilla D, Vigano C, et al. Perianal disease is associated with psychiatric co-morbidity in Crohn's disease in remission. Int J Colorectal Dis 2014;29(10):1285–1290.
3. Peyrin-Biroulet L, Cieza A, Sandborn WJ, et al. Development of the first disability index for inflammatory bowel disease based on the international classification of functioning, disability and health. Gut 2012;61(2):241–247.
4. Sheedy S, Bruining DH, Dozois EJ, Faubion WA, Fletcher JG. MR imaging of perianal Crohn disease. Radiology 2017;282(3):628–645.
5. Quattrocchi CC, van der Molen AJ. Gadolinium retention in the body and brain: is it time for an international joint research effort? Radiology 2017;282(1):12–16.
6. Lo Re G, Tudisca C, Vernuccio F, et al. MR imaging of perianal fistulas in Crohn's disease: sensitivity and specificity of STIR sequences. Radiol Med 2016;121(4):243–251.
7. Gecse KB, Bemelman W, Kamm MA, et al. A global consensus on the classification, diagnosis and multidisciplinary treatment of perianal fistulising Crohn's disease. Gut 2014;63(9):1381–1392.
8. Beets-Tan RG, Beets GL, van der Hoop AG, et al. Preoperative MR imaging of anal fistulas: does it really help the surgeon? Radiology 2001;218(1):75–84.

Erratum

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Detection of Bone Marrow Edema in Nondisplaced Hip Fractures: Utility of a Virtual Noncalcium Dual-Energy CT Application

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In an early online edition, the article title should have read as follows: Detection of Bone Marrow Edema in Nondisplaced Hip Fractures: Utility of a Virtual **Noncalcium** Dual-Energy CT Application.

This has been corrected online and in print.