

## Small bowel cancer diagnosis: role of nuclear magnetic resonance

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### ABSTRACT

The diagnosis of small intestine tumors is challenging. Even in the era of modern medicine, standard approaches including echography, computed tomography-scan and conventional endoscopy are unable to reveal small bowel lesions. Video-capsule has substantially improved the evaluation of small bowel; however this procedure cannot be proposed to all patients and in particular to those experiencing intestine sub-occlusion. Nuclear magnetic resonance (NMR) of the abdomen is an additional diagnostic approach that offers high sensitivity in the identification of small bowel lesions. Here, we describe a case of small bowel neoplasia identified with NMR of the abdomen.

### Introduction

Small intestine tumors are rare, with an incidence of less than 1 case per 100,000/year and accounting for less than 0.5% of all cancers.<sup>1</sup> However, in almost 80% of the cases small bowel tumors are malignant.<sup>2,3</sup> Adenocarcinomas comprise 35-50% of all tumors, carcinoid

tumors 20-40%, lymphomas 15% and the remaining is characterized by sarcomas.<sup>4</sup> Generally, adenocarcinomas are located in the duodenum, while lymphomas and carcinoid tumors are frequently in the ileum. Benign tumors are generally stromal tumor and adenomas. Finally, cancers from other organs may infiltrate peritoneum and small bowel in metastatic diseases. Small bowel tumors did not have a recurrent clinical presentation and could be associated with abdominal pain, unspecific gastrointestinal symptoms or can exhibit symptoms/signs due to the secretion of different hormones.<sup>3</sup> The diagnosis of small bowel tumor is really challenging even in the modern medicine when novel approaches such as video capsule endoscopy and nuclear magnetic resonance (NMR) are available.<sup>5-12</sup> Here, we report the diagnosis of small bowel cancer with NMR in a patient presenting with intestine sub-occlusion.

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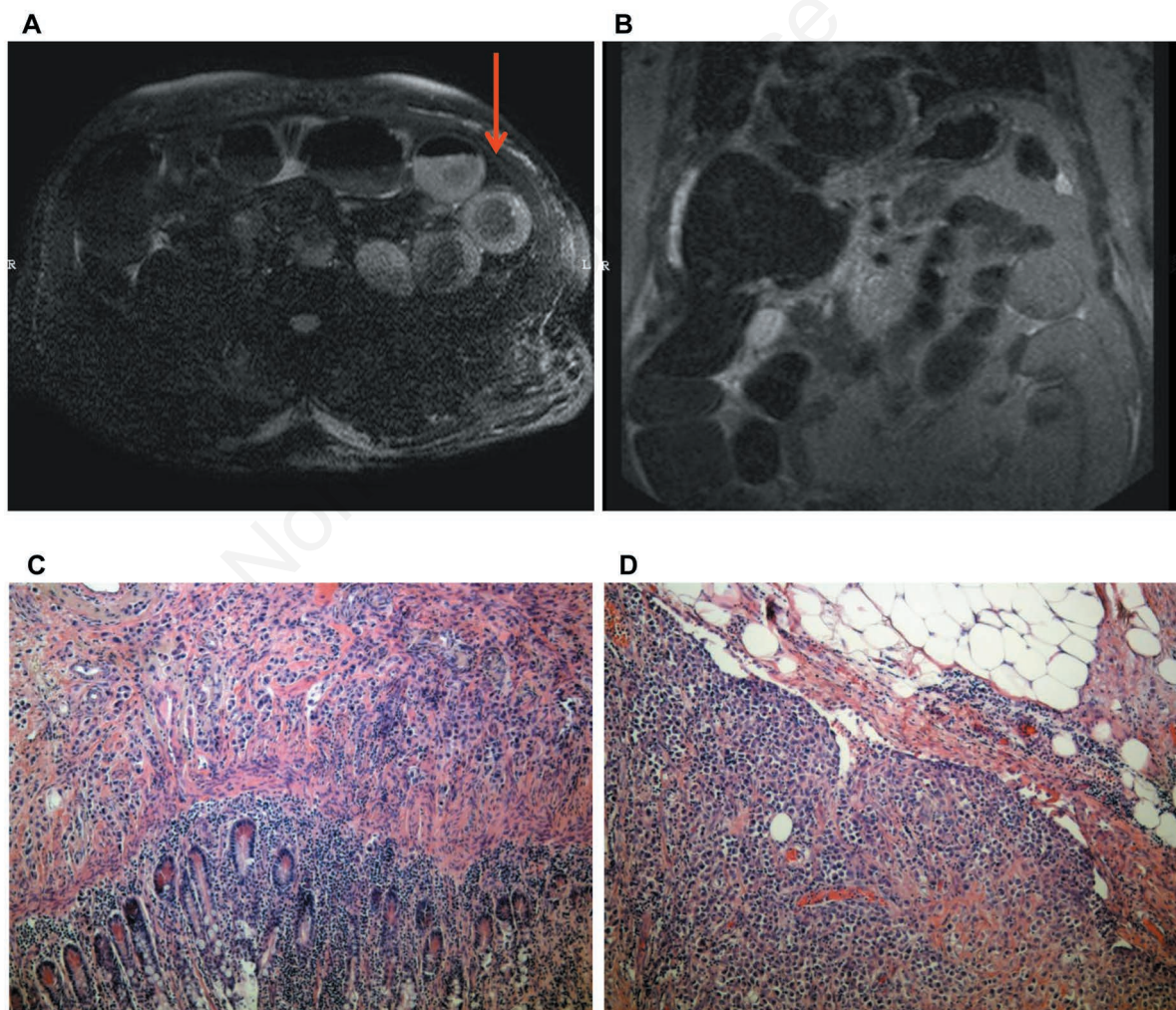
### Case Report

A male patient was admitted to our division of Internal Medicine because of abdominal pain, weight loss and intestinal sub-occlusion. Both abdomen echography and computed tomography-scan (data not shown) did not reveal any significant pathological signs. Due to the persistence of the symptoms, an abdomen NMR was performed. As shown in Figure 1A and B, NMR revealed that a portion of the small bowel was characterized by the swelling of the bowel wall. A laparoscopic surgical evaluation was performed confirming the presence of small bowel stenosis. This small intestine segment was therefore surgical removed. At the pathological examination, this portion of the bowel revealed an infiltration of the wall by an adenocarcinoma (Figure 1C). Moreover, infiltration of the peritoneum was also observed (Figure 1D).

## Discussion and Conclusions

This case report highlights how complex is the diagnosis of small bowel cancer. In particular, the management of patients with intestine sub-occlusion is indeed challenging. Both video-capsule endoscopy and NMR have been referred as powerful strategies to achieve, or to highly suspect, a diagnosis of small bowel cancer. The major limitation of video-capsule endoscopy relies on the fact that patients need to be reasonably fit for this investigation and should not display a sub-occlusive condition. Furthermore, video-capsule endoscopy is not available in all hospitals and requires long diagnostic times. On the contrary, NMR is a more accessible diagnostic procedure and is more cost-effective than capsule endoscopy. However, the great advantage of NMR vs video-capsule is that the NMR can be further implemented by novel additional

techniques. In particular, while T2-weighted sequences (with and without fat saturation) and T1-weighted fat saturated sequences remains the standard NMR diagnostic approach for the bowel evaluation, new NMR applications are able to provide additional insights, allowing to obtain a more reliable diagnosis.<sup>13</sup> Diffusion-weighted imaging or contrast-enhanced dynamic sequences should indeed be included in the NMR flow-chart to study bowel diseases, as extensively described elsewhere.<sup>13</sup> Finally, hybrid positron emission tomography/nuclear magnetic resonance (PET/NMR) imaging approaches are under evaluation in several fields of oncology,<sup>14,15</sup> allowing to integrate morphological analyses (NMR) with functional studies (PET). Therefore, in the next future, clinicians should have a comprehensive, reasonable cost-effective and clinically safe approach to identify the challenging small bowel cancers. Beside NMR implementations, this case re-



**Figure 1.** Nuclear magnetic resonance (NMR) evidence of small bowel neoplasia. A) and B) NMR images of the patient abdomen; C) hematoxylin and eosin stain of a portion of small intestine with the evidence of adenocarcinoma infiltration; D) hematoxylin and eosin stain showing infiltration at the peritoneum side of the small intestine.

port teaches that currently NMR should be considered as an essential procedure in the diagnostic flow-chart of patient with suspected small bowel neoplasia.

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