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CLINICAL CASE REPORT

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Rescue Radioguided Laparoscopy Surgery for Meckel's Diverticulum

Technical Notes

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Abstract: The extirpation of Meckel's diverticulum (MD) via conventional or laparoscopic surgery is the definitive treatment. However, certain circumstances may modify or alter this situation and require the application of exceptional measures.

We report a case under our observation who previously had an exploratory abdominal laparotomy for a suspected MD; however, the findings were negative. At that time, the diagnosis was established based on low-level gastrointestinal bleeding and isotopic tests that confirmed the existence of the diverticulum. Given the findings of gamma-graphic exploration and the previous negative surgical exploration, a decision was made to remove the lesion by laparoscopic radioguided surgery.

The patient underwent bilateral laparoscopic radioguided surgery using a gamma radiation detection probe. The exploration of the abdominal cavity noted the existence of the diverticulum about 60 to 70 cm from the ileocecal valve. In this way, it was possible to proceed with the resection of the bowel loop and perform an intracorporeal anastomosis termino lateral. The postoperative course was uneventful, and the patient was discharged on the fifth postoperative day.

We believe that the combination of radioguided surgery and single photon emission computed tomography/computed tomography could be useful for treating lesions in locations that are surgically difficult because of the characteristics of the lesion itself or the peculiarities of an individual patient.

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Abbreviations: MD = Meckel's diverticulum, SPECT/CT = single photon emission computed tomography/computed tomography.

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INTRODUCTION

Meckel's diverticulum (MD) is a remnant of the small intestine omphalomesenteric duct and represents a rare entity; an estimated 2% of the population are carriers.[1,2] Generally, asymptomatic latent MD may be discovered fortuitously during abdominal exploration via laparotomy or laparoscopy. In these circumstances, preventative extirpation is a debated issue, although it may lead to complications that require it to be done.[2] In any case, the surgical aspects of the pathology of MD have changed very little during the past years.[1,2] In fact, surgical indication, either by conventional or laparoscopic surgery, is questioned because of complications that may be caused by the surgical exploration such as peritonitis, occlusion, or other events, and cause bleeding.

Ultimately, extirpation with resection of the diverticulum, via conventional or laparoscopic surgery, is the definitive treatment regardless of the circumstances of its discovery and diagnosis, and generally does not consider the difficulties in the operative field with regards to its location and surgical treatment.[1,2] However, there may be certain circumstances that modify or alter this situation and that require exceptional measures be applied to facilitate the final result. This was the situation in our case under our observation, where the difficulty was increased by the fact that an abdominal surgical exploration had previously been done for a suspected MD, for which the findings were negative.

CASE PRESENTATION

A male, aged 28 years, had a medical history that included an exploratory laparotomy for MD, for which the findings were negative. At the time, however, the diagnosis was based on low-level gastrointestinal bleeding and isotopic tests that confirmed the existence of the diverticulum.

Sometime later, new episodes of lower gastrointestinal bleeding appeared. A colonoscopy did not show any pathological evidence and a gamma-graphy with 99mTc-pertechnetato showed pathological tracer uptake in the supravesical region. The behavior in this region over time was similar to that of the gastric mucosa, allowing establishment of a diagnosis of MD (Figure 1). Single photon emission computed tomography/computed tomography (SPECT/CT) confirmed the presence of the diverticulum, noting that the image was projected between loops of the small intestine, and identifying its anatomical location (Figure 2). Given the findings of the gamma-graphic exploration and the previous negative surgical exploration, a decision was made to remove the lesion by laparoscopic radioguided surgery.

Prior to the intervention, 370 MBq of 99mTc-pertechnetato was administered (Figure 3) then the patient underwent laparoscopic radioguided surgery using a gamma radiation

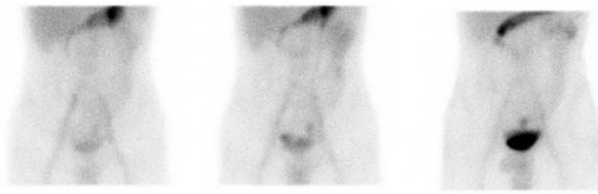

FIGURE 1. Anterior abdominal planar images at 5 min, 40 min, and 1 h after intravenous injection of 370 MBq of 99mTc-pertechnetate. Focal accumulation of tracer in supravesical region with similar behavior to gastric mucosa suggesting a MD could be observed.

detection probe (Europrobe model). The exploration of the abdominal cavity noted the existence of an important network of adhesions in the final sections of the small intestine. Liberation of the adhesions, directed by the probe, allowed us to find the diverticulum about 60 to 70 cm from the ileocecal valve (Figure 4). In this way, it was possible to proceed with the resection of the bowel loop and perform an intracorporeal anastomosis termino lateral.

Once the lesion was removed, a scan of the surgical bed was conducted with the probe, calibrated to the background radiation measurements, thereby confirming the complete extirpation of the lesion. The patient's postoperative course was uneventful and he was discharged on the fifth postoperative day. The anatomic pathological study of the specimen confirmed the diagnosis of extirpation of MD. The patient remains asymptomatic up to this writing.

This research followed the principles and standards of the Declaration of Helsinki of 1975, last revised in Seoul in 2008. They have respected the principles of confidentiality and patient autonomy.

It was not necessary the ethical approval by an ethics committee. He was not included in any control group and no experimental treatment was performed.

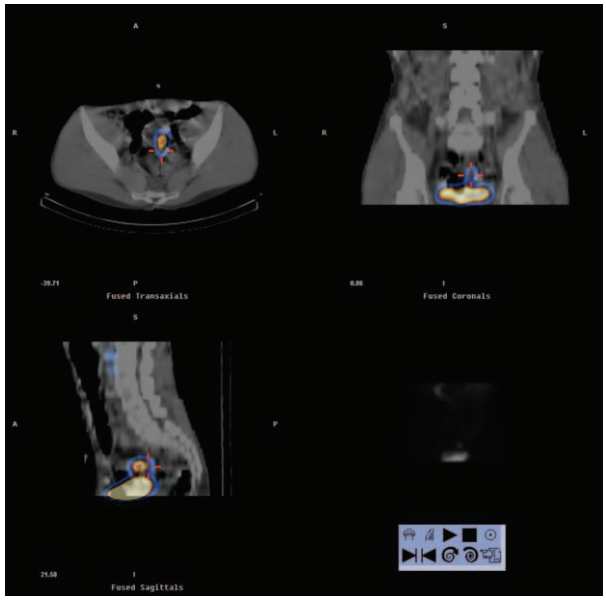

FIGURE 2. SPECT/CT showing focal radiotracer uptake projected in loops of small bowel allowing precise location of the diverticulum facilitating surgical planning.

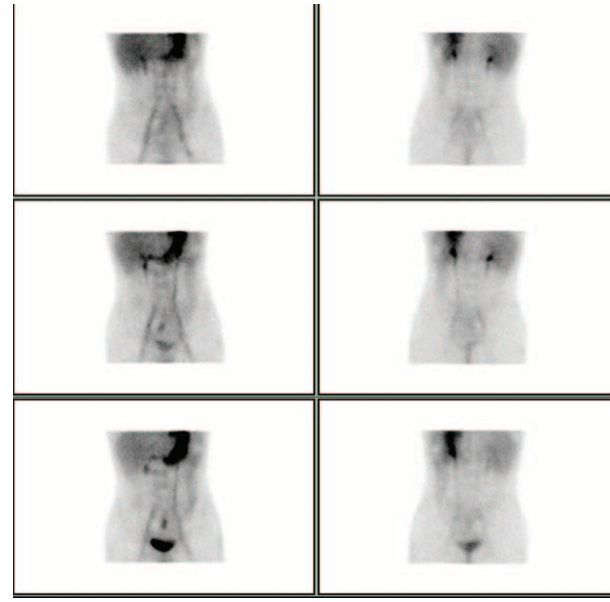

FIGURE 3. Preoperative abdominal planar images show the MD.

The patient was informed of his injury, diagnosis, and treatment. Informed consent was given.

DISCUSSION

MD is the most common congenital anomaly of the gastrointestinal tract. Most patients are asymptomatic, but in 25–40% of cases[3] it can lead to different types of complications such as peritonitis, intestinal obstruction, or lower gastrointestinal bleeding.

Despite the availability of different imaging techniques, diagnosis remains a challenge. Current imaging techniques, essentially CT, have the disadvantage that the findings may be nonspecific, and usually do not show any pathological alteration. Similarly, contrast media studies have low sensitivity.[4–6] In this vein, the gamma-graphy 99mTc-pertechnetato is a well-established technique for the diagnosis of MD.[2] It presents some variability in rates of sensitivity, ranging from

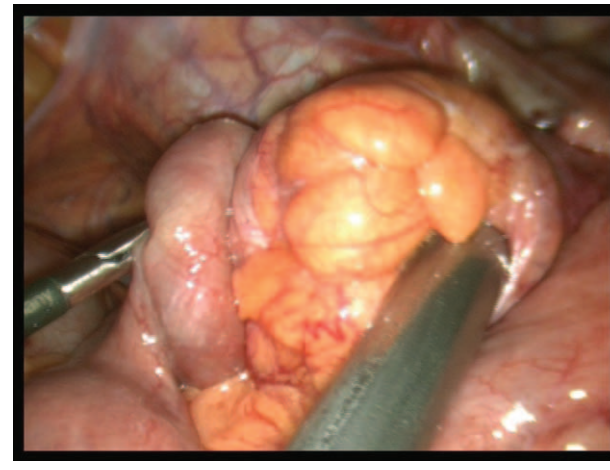

FIGURE 4. Intraoperative image, gamma probe points to the MD.

50% to 96%. This technique is less sensitive in the elderly because of the reduction in the ectopic gastric mucosa that occurs with age, and the sensitivity values are of 54% to 63% in this subgroup.[3] Moreover, the introduction of SPECT/CT may, as some authors point out,[6–8] improve the accuracy of scintigraphy diagnosis, especially before an uncertain or negative gamma-graphic image, because it increases the sensitivity in the diverticulum and the detection of the lesion is differentiated from physiological activity and potential artifacts, eliminating false positives. Also, SPECT/CT allows for better anatomical location of the lesion, facilitating the surgical approach.[6,8,9] Scintigraphy with 99mTc-pertechnetato has become the standard procedure for the diagnosis of MD, although the results of the endoscopic capsule must be evaluated.[2]

The need for radioguided surgery for surgical treatment of MD is questionable, or at least unnecessary. The use of radioguided surgery with the intraoperative use of a gamma detector probe facilitates specification the location of the lesion, particularly when it is used during laparoscopic surgery. Moreover, this situation shows a greater benefit in the case of the existence of intraabdominal adhesions from a previous surgery, as was the situation in our case under observation, in which the diverticulum was included within the package of adhesions and was thereby difficult to identify. Moreover, it also provides an advantage in confirming the complete resection of the lesion.

Indeed, radioguided surgery has proven useful in the treatment of certain pathologies and above all is an established indication in selective sentinel ganglion biopsy, breast cancer, and melanoma. Its use is an important element in cases for which the lesions are difficult to identify during the surgical procedure because of size, anatomical location, or a history of abdominal surgery for adhesions that hinders the discovery of the lesion during surgery. It is very useful when it is done in hand with a minimally invasive technique.

Radioguided surgery involves minimal irradiation and allows more conservative interventions to be performed while minimizing postoperative complications, and decreasing the surgical time, length of the hospital stay, and rate of morbidity associated with surgery. Also, it enables cost savings and optimization of material and human resources.[10–12] We believe that the combination of radioguided surgery and SPECT/CT could be essential for lesions in difficult surgical locations due to the characteristics of the lesion itself or the individual peculiarities of the individual patient.

Except for our own previous study[13] analyzing the usefulness of laparoscopic radioguided surgery in the treatment of MD, no other literature was found on this topic. Interest in using this technique in our case arose because of the patient's history of surgery for MD, for which the findings were negative, and the surgical difficulties involved when intraabdominal adhesions are present. However, radioguided surgery is used to treat other intraabdominal lesions. Some authors described an interest in using radioguided surgery for resection of intraabdominal metastasis[9,10] while others have suggested the technique could be used to identify lymph node metastases and to confirm the complete resection of metastasis.[12]

In our case, the information provided by SPECT/CT was particularly valuable and facilitated the radioguided laparoscopic surgery because of the significant distortion of the abdominal anatomy after the patient's previous abdominal surgery. It should be noted that in the case of MD, the lesion to background signal ratio was wide. This facilitated the search for the diverticulum, which had activity that was easily detected with the gamma detector probe since the tracer was not taken up by other organs that could have interfered with its detection.

Laparoscopic radioguided surgery for surgical treatment of MD in patients with a history of abdominal surgery may help provide information about the precise location of the lesion. Additionally, this surgical procedure could reduce the risk of possible postoperative complications and subsequent early recovery.

In short, SPECT/CT and laparoscopic radioguided surgery provide 2 fundamental tools that can be used in the surgical approach to lesions in abdomen, especially in patients who have undergone previous abdominal surgery.

CONCLUSION

The surgical perspective regarding MD there have been minimal changes during the past years. Conventional or laparoscopic diverticulectomy is currently the standard treatment.

However, because of some intraabdominal circumstances may difficult their location with a laparoscopic approach. In these cases, the radioguided laparoscopic procedure may help the surgeon, especially after previous surgical abdominal interventions that can distort the normal anatomy.

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