

# Continued Diagnostic Difficulties in Preoperatively Differentiating Lipiodized Oil and Residual Metallic Material: A Case Report

Masashi Haraguchi<sup>1\*</sup>, Shinichiro Ito<sup>1</sup>, Kohei Kotera<sup>2</sup>, Aya Fukushima<sup>3</sup>, Toshio Fukuda<sup>3</sup>, Hiroataka Tokai<sup>1</sup>, Kazumasa Noda<sup>1</sup>, Masataka Hirabaru<sup>1</sup>, Toshiyuki Adachi<sup>1</sup>, Nobuhiro Tada<sup>1</sup>, Keiji Inoue<sup>1</sup>, Shinya Onizuka<sup>1</sup>, Shigeki Minami<sup>1</sup>

<sup>1</sup>Department of Surgery, Nagasaki Harbor Medical Center City Hospital, Nagasaki, Japan

<sup>2</sup>Department of Obstetrics and Gynecology, Nagasaki Harbor Medical Center City Hospital, Nagasaki, Japan

<sup>3</sup>Department of Radiology, Nagasaki Harbor Medical Center City Hospital, Nagasaki, Japan

Email: [haraguci@mb.ejnet.ne.jp](mailto:haraguci@mb.ejnet.ne.jp)

Received 7 March 2016; accepted 18 April 2016; published 21 April 2016

Copyright © 2016 by authors and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

---

## Abstract

Retained foreign objects in the abdomen and pelvis are serious clinical problems yet the imaging required can present difficulties. Prolonged retention of lipiodized oil used for hysterosalpingography over years is very rare. However, lipiodized oil had previously been misdiagnosed as residual metallic material. We are reporting a case in which the latest computed tomography (CT) equipment seemed inadequate for obtaining a clear pre-operative diagnosis. Here, we describe the case of a 33-year-old Japanese female whose pelvis had contained retained lipiodized oil that had been suspected as residual metallic material. The preoperative diagnosis was very difficult and included three-dimensional computed tomography (3D-CT) of unclear results despite expectations of resolution. By laparoscopic surgery, we removed a cyst of approximately 2 cm containing a yellowish oily fluid. Postoperatively, we demonstrated that the fluid was lipiodized oil. A postoperative experiment to attempt distinguishing lipiodized oil from metal through gemstone spectral CT imaging did not offer clarity either. Distinguishing between retained lipiodized oil and metallic material in the abdominal cavity may still present unexpected difficulties even with the latest medical equipments.

---

\*Corresponding author.

## Keywords

### Lipiodized Oil, Hysterosalpingography, Residual Metallic Material

## 1. Introduction

Retained surgical materials in the abdomen and pelvis can present serious clinical problems; yet their imaging appearances have been reported as potentially confusing and difficult to interpret [1]. Risk factors for retention of surgical materials include emergency operation, unplanned change of procedure, and high patient body mass index. Although materials such as surgical sponges will become profoundly symptomatic in the early postoperative period, it is possible for lipiodized oil, which is often used for hysterosalpingography, to remain unnoticed for months or years without symptoms [1] [2]. There is a previous report of retained lipiodized oil, within the pelvis, mimicking a retained metallic foreign body that was removed surgically [3]. Because our patient presented a situation similar to that of the previous report, we attempted to determine whether an unidentified retained foreign body might be a metallic object or lipiodized oil. For perplexing cases which may not be apparent on conventional axial CT images, 3D-CT can offer many advantages in diagnosis and management of a retained foreign body [4]. Gemstone spectral imaging on single-source dual-energy CT can examine the relation between CT attenuation values and iodine concentration [5]-[7], which would appear applicable given the high iodine concentration of lipiodized oil. However, as neither resource offered conclusive evidence in our case, we describe continued limitations in demonstrating retained lipiodized oil in the abdominal cavity preoperatively using current medical equipments.

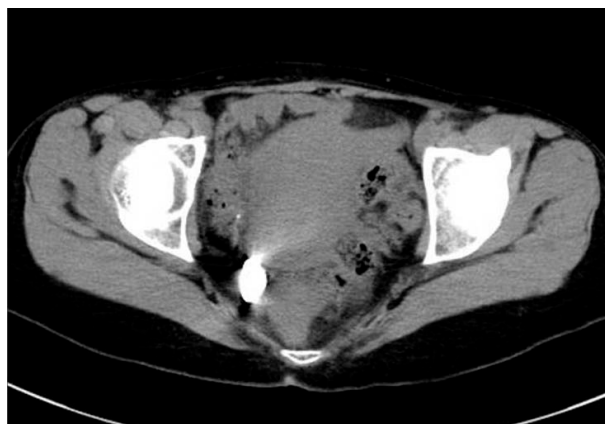
## 2. Case Report

A 33-year-old Japanese female with twins visited a local internal medicine clinic because of fever and epigastralgia in August 2014. Abdominal radiography taken at the clinic showed a high-density material measuring about 2 cm at the right floor side of the pelvis (Figure 1). Her children were delivered 6 years ago in 2008 at our hospital by Caesarian section due to premature rupture and breech presentation. No radiographs were obtained before or after that surgery because of extreme emergency, and she had not received any other operations. To clarify the unidentified foreign body, a CT scan was performed (Figure 2) showing a foreign body with density of 3053 Hounsfield Units (HU). The CT value was so high that we suspected the possibility of residual metallic material from the emergency operation. But, hospital files for the emergency operation did not record any missing instruments.

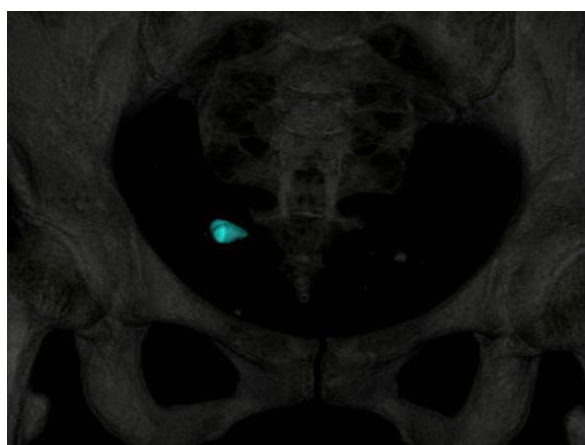
On the other hand, we learned from the preoperative interview that the patient had undergone hysterosalpingography at a local obstetrics and gynecology clinic for an inspection of infertility before the pregnancy. Thus, we also considered the possibility of residual oil-based contrast media. A 3D-CT was performed to gain some clarity about the residual high-density material (Figure 3(a) and Figure 3(b)), but we could not identify any decisive evidence.



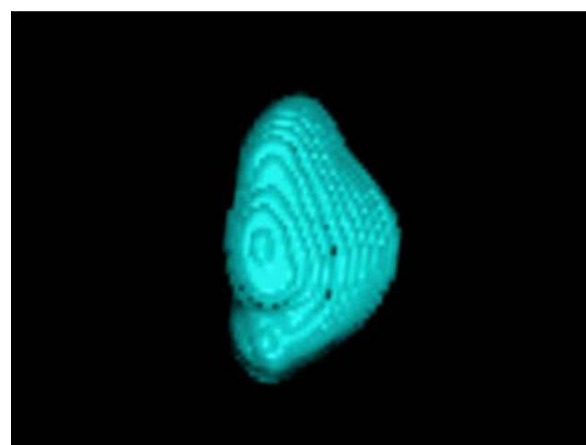
Figure 1. Abdominal radiography shows a high-density material within the pelvis.



**Figure 2.** CT shows a high-density material with streak artifact to the right of the rectum.



(a)



(b)

**Figure 3.** (a) Three-dimensional computed tomography of the unidentified foreign body; (b) Enlarged view of material.

A laparoscopic surgery was performed to remove the material, because we could not rule out the possibility of metal and the patient requested the surgery. However, during the operation we did not find any metallic material in the pelvis. Therefore, we tried to locate the unidentified foreign body using X-ray imaging equipment. We found it below the peritoneum of the right floor side of the pelvis. The foreign body was a soft cyst of approximately 2 cm, and it was removed without injury (**Figure 4**). The cyst showed high density on radiography and contained a yellowish oily fluid. The fluid was sent to the School of Pharmaceutical Sciences, Graduate School of Biomedical Sciences, Nagasaki University and was shown to be very similar to the lipiodized oil.

After this operation, we were able to confirm from the doctor in charge at the local obstetrics and gynecology clinic that the lipiodol was used for hysterosalpingography.

### 3. Discussion

Hysterosalpingography is used commonly in the evaluation of infertility and in the diagnosis of anomalies of the uterus and fallopian tubes [8]. Lipiodized oil is an iodinated oil developed in 1922 that is widely used for hysterosalpingography. Oil-based contrast media such as lipiodol is thought to cause less discomfort to the patient, reduce the risk of pelvic infection, and be more effective at promoting fertility [9] [10]. Lipiodized oil is usually secreted via the lymphatic system within a few months, and prolonged retention over years is rare; however, retention appears to have been years-long in the report of misdiagnosis as residual metallic material [3]. Yet in investigating the current state of preoperative resources for our case, the 3D-CT image did not offer any suggestion as to the type of material contained in the high-density foreign body. As with the previous reported case, we



**Figure 4.** Intraoperative image of the cyst removed during laparoscopic surgery.

could not perform Magnetic resonance imaging (MRI) because of the possibility that the material might be a metallic object. A clear result from our attempts by 3D-CT or some other means might have helped avoid performing an unnecessary operation, as our patients had no symptoms due to the foreign body.

Postoperatively, we attempted an experiment to discriminate by gemstone spectral imaging on single-source dual-energy CT in another facility: lipiodol contains iodine, and spectral CT imaging can provide correct registration of data sets for conduction of accurate iodine-based material decomposition images [5]-[7]. However, there were no clear means of distinction. Our reasoning for this experiment was that a CT value obtained by conventional single-source CT system could have greater uncertainty because of the beam hardening effect. A CT value over 1000 HU is unreliable and inconsistent [3]. Therefore, the CT value of 3053 HU preoperatively by conventional CT system might not have been reflective of the accurate value, and there is a possibility that the actual value was considerably higher. In other words, the diagnostic difficulty in our case might have been related to inapplicability of non-CT diagnostics combined with CT limitations at very high HU, even by 3D or by spectral imaging, where the highest reported HU value for a range of iodine concentrations was below 2700 [5].

#### 4. Conclusion

It is quite difficult to demonstrate retained lipiodized oil in the abdominal cavity preoperatively by the latest medical equipment. And, in our case, we should have conducted abdominal radiography immediately after Caesarian section. Had we done so, we may have prevented an operation at this time. This case highlighted the importance of a detailed preoperative interview concerning hysterosalpingography. However, we especially hope for the further progress of image analysis equipment especially for high Hounsfield Unit materials to help avoid unnecessary surgery.

#### Acknowledgements

The authors would like to thank Dr Naotaka Kuroda and Dr Naoya Kishikawa (Graduate School of Biomedical Sciences, School of Pharmaceutical Sciences, Nagasaki University), who proved experimentally that a yellowish oily fluid was the lipiodized oil. And, we express our special thanks to American Medical Writers Association member Charles de Kerckhove for review.

#### Conflict of Interest

The authors state that they have no Conflict of Interest (COI).

#### References

- [1] O'Connor, A.R. and Coakley, F.V. (2004) Retained Surgical Materials in the Postoperative Abdomen and Pelvis. *Seminars in Ultrasound, CT, and MRI*, **25**, 290-302. <http://dx.doi.org/10.1053/j.sult.2004.03.010>
- [2] Gayer, G., Petrovitch, I. and Jeffrey, R.B. (2011) Foreign Objects Encountered in the Abdominal Cavity at CT. *Radio-*

- graphics, **31**, 409-428. <http://dx.doi.org/10.1148/rg.312105123>
- [3] Wakabayashi, Y., Hashimura, N. and Kubouchi, T. (2004) Retained Lipiodized Oil Misdiagnosed as Residual Metallic Material. *Radiation Medicine*, **22**, 362-363.
- [4] Ariz, C., Horton, K.M. and Fishman, E.K. (2004) 3D CT Evaluation of Retained Foreign Bodies. *Emergency Radiology*, **11**, 95-99. <http://dx.doi.org/10.1007/s10140-004-0373-0>
- [5] Wang, L., Liu, B., Wu, X.W., Wang, J., Zhou, Y., Wang, W.Q., Zhu, X.H., Yu, Y.Q., Li, X.H., Zhang, S. and Shen, Y. (2012) Correlation between CT Attenuation Value and Iodine Concentration *in Vitro*: Discrepancy between Gemstone Spectral Imaging on Single-Source Dual-Energy CT and Traditional Polychromatic X-Ray Imaging. *Journal of Medical Imaging and Radiation Oncology*, **56**, 379-383. <http://dx.doi.org/10.1111/j.1754-9485.2012.02379.x>
- [6] Ogata, T., Ueguchi, T., Yagi, M., Yamada, S., Tanaka, C., Ogihara, R., Isohashi, F., Yoshioka, Y., Tomiyama, N., Ogawa, K. and Koizumi, M. (2013) Feasibility and Accuracy of Relative Electron Density Determined by Virtual Monochromatic CT Value Subtraction at Two Different Energies Using the Gemstone Spectral Imaging. *Radiation Oncology*, **8**, 83. <http://ro-journal.biomedcentral.com/articles/10.1186/1748-717X-8-83>  
<http://dx.doi.org/10.1186/1748-717x-8-83>
- [7] Xu, Y., Xiao, A., Yang, J., Zhang, Z. and Zhang, G. (2015) Assessment of Lipiodol Deposition and Residual Cancer for HCC after TACE via Iodine-Based Material Decomposition Images with Spectral CT Imaging: A Preliminary Study. *Iranian Journal of Radiology*, **12**, e26009. <http://dx.doi.org/10.5812/iranjradiol.26009>
- [8] Lindequist, S., Justesen, P., Larsen, C. and Rasmussen, F. (1991) Diagnostic Quality and Complications of Hysterosalpingography: Oil- versus Water-Soluble Contrast Media—A Randomized Prospective Study. *Radiology*, **179**, 69-74. <http://dx.doi.org/10.1148/radiology.179.1.1848715>
- [9] Rasmussen, F., Lindequist, S., Larsen, C. and Justesen, P. (1991) Therapeutic Effect of Hysterosalpingography: Oil-versus Water-Soluble Contrast Media—A Randomized Prospective Study. *Radiology*, **179**, 75-78. <http://dx.doi.org/10.1148/radiology.179.1.1848716>
- [10] Grosskinsky, C.M., Clark, R.L., Wilson, P.A. and Novotny, D.B. (1994) Pelvic Granulomata Mimicking Endometriosis Following the Administration of Oil-Based Contrast Media for Hysterosalpingography. *Obstetrics & Gynecology*, **83**, 890-892.