

### 3D-Quantification of Abdominal Fat Using MRI in Cynomolgus Monkeys

○ Iori ITAGAKI<sup>1</sup>, Hiromi OGAWA<sup>1</sup>, Hayato NARITA<sup>1</sup>, Hiroaki SHIBATA<sup>2</sup>

<sup>1</sup> The Corporation for Production and Research of Laboratory Primates, <sup>2</sup> Tsukuba Primate Research Center, National Institute of Biomedical Innovation  
E-mail address: itagaki@primate.or.jp

**Introduction:** This study is to establish an analytical method for quantification of abdominal fat tissue based upon actual three-dimensional (3D) configuration of intraabdominal fat (IaF) and subcutaneous fat (ScF) in cynomolgus monkeys using magnetic resonance imaging (MRI) technique. Excess calories and hypokinetic lifestyle commonly result in obesity. It is also usual with this species of monkey, especially in husbandry. Obese macaques are unique model of human obesity and occasionally die a sudden without prior indication of illness or following brief weight loss (Fatal fasting syndrome).

**Materials and methods:** Ten female cynomolgus monkeys have been kept individually, 10 to 25 years old in age and 3.10 to 6.80 kg in body weight, were anesthetized by isoflurane inhalation with monitoring of vital signs. Then abdominal portion of these animals were scanned by Allegra 3.0T with *syngo* MR A30 for operation software (SIEMENCE, Germany) to get three types of spin-echo T1-weighted images (T1WI) in the following conditions;

- T1WI-1: Slice thickness 2.0mm, Repetition time 500ms, Echo time 15ms, in sagittal section
- T1WI-2: Slice thickness 2.0mm, Gap between slices 2.0mm, Repetition time 1,640ms, Echo time 9.5ms, without Water suppression, in coronal section
- T1WI-3: Slice thickness 2.0mm, Gap between slices 2.0mm, Repetition time 1,640ms, Echo time 9.5ms, with Water suppression, in coronal section

Tissues of IaF and ScF were quantified with ImageJ 64 (National Institute of Health, USA) on sequential 30 of T1WI-3 which were identified as upper than lumbosacral junction in referred with T1WI-1. T1WI-2 were referred for anatomic understanding. The MR images were converted to 16-bit grayscale stacks in 768 x 768 pixel resolution (768 pixels = 210.00 mm), then following two types of image in 8-bit grayscale were abstracted using Binary command;

- (A) T1-high area of both IaF and ScF
- (B) An area formed by manually traced line roughly placed between IaF and ScF

IaF and ScF areas (mm<sup>2</sup>) were measured on the images which were obtained by the following image calculations;

$$\begin{aligned}\text{Image IaF} &= \text{Binary image (A)} - \text{Binary image (B)} \\ \text{Image ScF} &= \text{Binary image (A)} - \text{Image IaF}\end{aligned}$$