INTRODUCTION: Magnetic resonance cholangiopancreatography (MRCP) can accurately depict physiologic morphological features of biliary and pancreatic diseases with apparently dilated biliary duct and pancreatic duct. However, to our knowledge, most publications have not focused on the narrow distal pancreatobiliary ducts covered by the Oddi sphincter. The Oddi sphincter generate the sphincteric basal pressure which is higher than that of the more proximal segment and the phasic wave which contracts nearly five times per a minute. Therefore, MRCP could not depict clearly the narrow distal segment shaped by the sphincter. Furthermore, it becomes clinical problem for the forceful sphincteric contraction to shape semicircular defects which can not be distinguished from tumors or stones. We hypothesized that if the simultaneous overloading of pancreatobiliary secretion and the relaxation of the Oddi sphincter occurred by using fatty meal and secretin stimulation, our pharmacodynamic MRCP (PDMRCP) might have potential to facilitate visualization of a sphincteric contraction range including the common channel. The purpose of this study was to clarify the quantitative relationship between the common channel and the sphincteric contraction range by means of our proposed PDMRCP.

SUBJECTS and METHODS: Twelve volunteers (twelve men; age range, 25-43 years; mean age 33 years) without pancreatobiliary diseases were examined by a 1.5-T Magnetom Vision (Siemens, Erlangen, Germany) with a body phased array receive coil. All gave their informed consent. Study procedures were as follows: (1) all subjects were asked to fast at least 6 hours before the examination, then was asked to have an oral intake of the solution of 20cc saline and 13g Molykoy as gallbladder contractible agent (Toho Kagaku Kenkyusho, Tokyo, Japan) which consisted of yolk of hen’s egg 4.00g, lactose 6.02g, sucrose fatty acid ester 2.00g, D-sorbitol 0.5g, malt essence 0.35g, and a small quantity of sodium saccharin, sodium dehydroacetate and flavor. (2) RARE sequence of 20 or 30mm thickness were performed in various right anterior projections. The best plane depicting the distal pancreatobiliary ducts was decided among theses planes, (3) coronal single-shot RARE sequence were repeatedly performed until the cholecystokinin secreted by fatty meal stimulation contracted the gallbladder to some extent, (4) RARE sequence with the best oblique angle was performed three times in sixteen seconds breath-holds as soon as secretin (100 secretin unit / body) was slowly injected into the antecubital vein, and the dynamic procedure was conducted during 7 minutes. The parameters of RARE were as follows, TR 2800 msec, TE 1100 msec, echo train length 240, echo spacing time 10.2 msec, field of view 250-280 mm, slice thickness 20-30 mm, matrix 240×256, one acquisition. A chemical selective fat suppression was applied. One single slice was acquired in 2.5 sec during breath-holding. The length of the common channel and the contraction range of the Oddi sphincter were measured on the MR console.

RESULTS: In all cases, PDMRCP showed repeatedly the contraction phase and the relaxation phase of the Oddi sphincter. The length of the sphincteric contraction range was measured by comparison of the most contracted image and relaxed image on MR console. That of sphincteric contraction range over the bile duct ranged from 8 to 19 mm (11.8±3.2 mm, mean±standard deviation) and over the main pancreatic duct ranged from 8 to 13 mm (10.0±1.5 mm). In the eleven of twelve cases, the common channels were recognized in the relaxation phase of the Oddi sphincter, and the length ranged from 3 to 8 mm (5.2±1.3 mm). In the rest one, the distal segments of the bile duct and the main pancreatic duct could be observed, however, the definite junction of their ducts and the common channel was not recognized in any phase of PDMRCP.

DISCUSSION: PDMRCP could improve the delineation of the distal biliary and pancreatic segment covered by the Oddi sphincter, furthermore, this technique clarified the quantitative relationship between the common channel and the sphincteric contraction range over both biliary and pancreatic duct. The PDMRCP was clinically applicable because the technique was simple and safe, the examination time was not so long, and the fatty meal and secretin were not expensive. This technique could differentiate semicircular defects shaped by the forceful sphincteric contraction from bile duct tumor, pancreatic ductal tumor, biliary stones or pancreatic stones. Furthermore, this technique might have potential to evaluate some functional diseases related to the Oddi sphincter as biliary dyskinesia and pancreatocholedocho-reflux causing unknown abdominal pain. Further examinations are needed.