





*Fig. 1. (A) T2-weighted coronal MR image. A coronal image using T2-weighted multi-slice technique without fat suppression clearly demonstrates the relationship between the calculus (black arrow) and common hepatic duct (white arrow) and excludes any other possible etiology of obstruction-like soft tissue mass. Diffuse wall thickening of the gall bladder is seen. (B) MR cholangiopancreatography: maximal intensity projection (MIP). A MIP image shows a round dark signal of a large calculus (arrow) in the neck of the gallbladder, compressing the common hepatic duct. MIP images can be rotated to any direction for accurate evaluation of the relation between the gallbladder and common hepatic duct. (C) MR cholangiopancreatography: single-projection. A single-projection image shows the same image as a MR cholangiopancreatogram by MIP reconstruction. The arrow indicates a calculus in the gallbladder.*

ologic report was ulceration and chronic inflammation with subepithelial fibrosis, but without malignancy. MRCP was carried out with a 1.5 T scanner (Horizon; GE Medical Systems, Milwaukee, WI, U.S.A.) using a phased-array torso coil. CT images, which the patient had previously undergone at another institution, were available at the time of MRI review. A 2-cm round stone was impacted in the neck of the gall bladder as the cause of obstruction in the common hepatic duct without any abnormal mass lesion, suggesting malignancy (Fig. 1). Diffuse wall thickening of the gall bladder was clearly demonstrated in multi-slice source images without fat suppression (Fig. 1, A-C). At this point, Mirizzi syndrome was strongly suspected and the patient was referred for laparotomy. At laparotomy, a 2.5 cm-pigmented stone was found to be impacted in the neck of the gall bladder. There was evidence of severe cholecystitis with adhesion to the common hepatic duct. Segmental resection of the common duct was inevitable. Cholecystobiliary fistula was not found.

## DISCUSSION

Recently, magnetic resonance imaging (MRI) has been successfully applied for diagnosing Mirizzi syndrome.<sup>7</sup> With technical advances of MRI, MRCP has been performed complementary to ERCP, or even routinely for the evaluation of pancreaticobiliary diseases. MRCP is recommended instead of ERCP because it has the advantages of noninvasiveness, virtually no procedure-related mortality or morbidity,

and visualization of the proximal duct in case of complete obstruction, particularly when therapeutic procedure is not anticipated.<sup>8</sup> The recently introduced single-shot fast spin-echo (SSFSE) or half-Fourier single-shot turbo spin-echo (HASTE) technique have enabled the depiction of normal structures and the presence and level of biliary obstruction accurately without motion artifact.<sup>9</sup> However, in diagnosing Mirizzi syndrome, a cholangiographic image like ERCP or MRCP is not sufficient to exclude malignancy.

Choi et al. noticed that T2-weighted images with relatively short TE without fat suppression were more informative than source images for maximal intensity projection (MIP) in tissue characterization.<sup>10</sup> They reported 93% and 96% sensitivity in diagnosing malignancy and calculous disease of the pancreaticobiliary system, respectively, with a combination of MRCP and T2-weighted image. In considering the limitations of MRCP, short-T2 material in the lumen of bile ducts is not easily differentiated from a true stone or other obstructive lesion. This is a consequence of water imaging with only bright or dark signals permitted, which only resembles direct cholangiography from the aspect of just showing a lesion as a filling defect regardless of its nature. In our patient, Mirizzi syndrome was dramatically depicted in T2-weighted image without fat suppression, showing irregular GB wall thickening with a dark calcified stone impacted in the neck of the gall bladder and compressed common hepatic duct without evidence of malignancy in surrounding tissue. MIP images and multi-slice source images showed only bright lumen

of CBD and GB with focal narrowing and round filling defect, respectively.

In conclusion, one-stop MR imaging is a possible substitute for a combination of cross-sectional imaging including ultrasonography or CT and cholangiographic imaging including ERC or PTC. A T2-weighted MR image can detect all the diagnostic components of Mirizzi syndrome and exclude malignancy as a cross-sectional imaging, while MRCP can delineate the shape and extent of bile duct stenosis and detect fistula as a ductal image. Furthermore, T2-weighted image without fat suppression can be obtained in a relatively short period of time (about 20 seconds) using SSFSE sequence. Therefore, MRI can be used as a primary diagnostic tool for suspected Mirizzi syndrome in order to reduce the diagnostic delay for ultrasonography or CT and direct cholangiography before surgery. The accuracy in detecting cholecystobiliary fistula should be determined with MRCP and T2-weighted image in appropriate cases.

## REFERENCES

1. Mirizzi PL. Syndrome del conducto hepatico. *J Int de Chir* 1948;8:731-77.
2. Dietrich KF. Die Hepaticusstenose bei Gallenblasenhals- und Zysticussteinen. *Brun's Beitr Klin Chir* 1963;206:9-22.
3. Pedrosa CS, Casanova R, De la Torre S, Villacorta J. CT findings in Mirizzi syndrome. *J Comput Assist Tomogr* 1983;7:419-25.
4. Toscano RL, Taylor PH Jr, Peters J, Edgin R. Mirizzi syndrome. *Am Surg* 1994;60:889-91.
5. Becker CD, Hassler H, Terrie F. Preoperative diagnosis of the Mirizzi syndrome: limitations of sonography and computed tomography. *AJR* 1984;143:591-6.
6. Cruz FO, Barriga P, Tocornal J, Burhenne J. Radiology of the Mirizzi syndrome: diagnostic importance of the transhepatic cholangiogram. *Gastrointest Radiol* 1983;8:249-53.
7. Doai K, Uchiyama K, Kuniyasu Y, Saisyo H. MR cholangiopancreatography of Mirizzi syndrome and Lemmel syndrome. *Nippon Rinsho* 1998;56:2933-8.
8. Soto JA, Yucel EK, Barish MA, Chuttani R, Ferrucci JR. MR cholangiopancreatography after unsuccessful or incomplete ERCP. *Radiology* 1996;199:91-8.
9. Fulcher AS, Turner MA, Capps GW, Zfass AM, Baker KM. Half-Fourier RARE MR cholangiopancreatography: Experience in 300 subjects. *Radiology* 1998;207:21-32.
10. Choi BW, Kim MJ, Chung JJ, Chung JB, Yoo HS, Lee JT. Utility of single shot fast spin echo technique in evaluating pancreaticobiliary diseases: T2-weighted image and magnetic resonance cholangiopancreatography. *J Korean Radiol Soc* 1999;41:515-24.