Management of branch-duct-type intraductal papillary mucinous neoplasms of the pancreas: observation with MR Imaging and MR cholangiopancreatography

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Intraductal papillary mucinous neoplasm (IPMN) of the pancreas is the term to describe a spectrum of proliferation of the pancreatic ductal epithelium with production of excessive amounts of mucin and progressive dilatation of the main pancreatic duct (diffuse or segmental), of cyst dilatation of the branch ducts, or of both, depending on the site and extent involvement; these tumors represent a critical field, potentially bearing adenoma, in situ carcinoma or invasive carcinoma. Although IPMNs of the pancreas are traditionally considered potentially malignant lesions, cross-sectional imaging studies suggest that exclusive branch-duct involvement is associated with a lower risk of carcinoma and a favourable prognosis than main pancreatic duct involvement. The purpose of this exhibit was to evaluate the clinical outcome of conservative management by observation with MR imaging and MR Cholangiopancreatography (MRCP) of patients with pancreatic branch-duct-type intraductal papillary mucinous neoplasms (BD-IPMNs).
Methods and Materials

Fifty-four patients with diagnosis of pancreatic BD-IPMNs who had cysts less than or equal to 30 mm in diameter without mural nodules, underwent initial and follow-up MR imaging and MRCP at 1.5T device. The phased-array coil was used for both excitation and signal reception. Ten minutes before MRI, a super-paramagnetic suspension (Lumirem® 100 ml, Guerbet) was orally administered to suppress the signal intensity of overlapping fluid-containing organs. Scopolamine methyl-bromide (Buscopan® 20 mg/ml, Boehringer Ingelheim) was intramuscularly administered immediately before starting the examination in order to avoid peristaltic artefacts.

The imaging protocol began with axial, breath-hold, with and without fat-suppressed spoiled gradient-echo (SPGR) T1-weighted images (repetition time, 110-130 msec; echo time, minimum full, with effective 2.1-2.3 msec; flip angle, 80°; section thickness, 5 mm; interslice gap, 0.5 mm; matrix size, 256x192 pixels; signal averaged, 1; acquisition time, 28-32 seconds); axial, respiratory-triggered, fat-suppressed, fast spin-echo (FSE) T2-weighted sequence (repetition time automatically adapted to the patient's breathing pattern, 6000-18000 msec; echo time, 95.5 msec; echo train length, 16; section thickness, 5 mm; interslice gap, 0.5 mm; signals averaged, 3-4; acquisition time, 3-4 minutes) and/or axial, breath-hold, single-shot fast spin-echo (SSFSE) T2-weighted sequence (repetition time, minimum; echo time, 80 msec; section thickness, 5 mm; interslice gap, 0.5 mm; signal averaged, 0.5-0.6; acquisition time, 18-24 seconds).

MRCP was performed by means of coronal respiratory-triggered, three-dimensional fast spin-echo (3D FRFSE), heavily T2-weighted sequence (repetition time automatically adapted to the patient’s breathing pattern, 3000-15000 msec; effective echo time, 622 msec; section thickness, 2.4 mm; interslice gap, -1.2 mm; field of view, 35-45 cm; matrix size, 256x128 pixels; signal averaged, 2; acquisition time, 3-4 minutes), and coronal breath-hold, thick-slab, single-shot fast spin-echo (SSFSE) T2w sequence (effective echo time, 1052 msec; thickness, 40-60 mm; field of view, 35-45 cm; matrix size, 256x256 pixels; 0.5 signal averaged; acquisition time, 1-2 seconds for every image).

All MR images were analyzed in consensus by two radiologists with more than 15 years experience on biliary and pancreatic MR imaging, who were blinded to patient identification and clinical data. Diagnostic image analysis included the evaluation of number of lesions, maximum diameter of cystic lesion, lesion location, associated main pancreatic duct (MPD) dilatation and/or filling defects within cystic lesion, and presence of interval changes on initial and serial follow-up MR images.
Results

The follow-up period ranged from 12 to 73 months and the follow-up intervals between 6 and 14 months. Cysts were located in the pancreatic head in 12 cases, in the body-tail in 15 cases and involved the entire gland in the remaining 27 cases. In 42 patients (77.8%) no significant change of the pancreatic findings was identified on follow-up MRI and MRCP (Figure 1, Figure 2).

Fig. 1: Figure 1 - A cystic lesion of the istmic region of the pancreas has a maximum diameter of 12 mm and doesn't show a significant change in the follow-up period of 58 months.

References: 2nd Department of Radiology, Pisa University Hospital - Pisa/IT
**Fig. 2:** Figure 2 - The dominant septal and lobulated cystic lesion of the pancreatic isthmus (maximum diameter 17 mm) and the microcyst of the pancreatic head (7 mm) don't show a significant change in the follow-up period of 45 months.

**References:** 2nd Department of Radiology, Pisa University Hospital - Pisa/IT whereas in 3 cases (5.6%) the cyst size decreased (Figure 3 a,b).
Fig. 3: Figure 3 a,b - a: MR exam of August 2005. The complex cystic lesion of the pancreatic body/tail has a maximum diameter of 22 mm. b: MR exam of August 2009. In the follow-period of 48 months the complex cystic lesion shows a reduction of the maximum diameter (15 mm versus 22 mm).

References: 2nd Department of Radiology, Pisa University Hospital - Pisa/IT
A slight tumor enlargement (mean diameter increase of 16.4%; range:10-30%) without associated MPD dilatation or filling defects was observed in 7 patients (12.9%) (Figure 4).
Fig. 4: Figure 4 - MR septal and lobulated cystic lesion of the pancreatic head (26 mm) and of the pancreatic body/tail (maximum diameter 22 mm). A progressive slight enlargement of 6 mm (28 mm versus 22 mm) in the follow-up period of 26 months was observed in the cystic lesion of the body/tail.

References: 2nd Department of Radiology, Pisa University Hospital - Pisa/IT
Only in two patients (3.7%) we detected a filling defect within cystic lesion that was confirmed at surgery.
Conclusion

The management of pancreatic intraductal papillary mucinous neoplasms has been controversial and the therapeutic strategy of these lesions mainly depends on the suspicion of malignancy emerging from the preoperative workup. Bernard et al. argue that IPMTs should undergo limited resection in branch duct types smaller than 30 mm in diameter without mural nodules; on the other hand, Matsumoto et al. sustain that branch duct types may be treatable with limited resection or careful observation.

MR imaging and MRCP is regarded as the most efficient imaging modality for the detection and preoperative staging of IPMT of the pancreas. In addition, endoscopic ultrasound (EUS) and positron emission tomography (18FDG-PET) in pancreatic malignancy have developed considerably as complimentary diagnostic tools. Positron emission tomography scan offers, by analysing metabolic activity within the wall of a cystic lesion, the possibility of investigating the nature of small mural nodules, morphologically demonstrated by MR, by functional data. However, some published experiences have reported low positron emission tomography (18FDG-PET) sensitivity in detecting malignant tissue presence in cystic lesions, but its value in managing IPMN is not yet demonstrated. As known EUS-guided aspiration and biopsy is useful in cases that are indeterminate at cross-sectional imaging.

The treatment controversy is mainly based on the fact that BD-IPMNs encompass a wide range of histologic findings, from apparently benign to overtly malignant, and foolproof prediction of malignancy is not possible. There have many reports concerning the imaging findings to determine the likelihood of malignancy; acceptable predictive sings of malignancy of BD-IPMNs are represented by the cyst size (greater than 30 mm in maximal diameter), the presence of associated MPD dilation and/or the presence of filling defects within the cystic lesion (representing mural nodules).

In our study group of selected patients with pancreatic BD-IPMNs who had cysts less than or equal to 30 mm in diameter without mural nodules, a slight lesion enlargement at MR follow-up was observed in 7 out of 54 cases (12.9%) and in only 2 patients (3.7%) MRI and MRCP revealed the appearance of filling defects within the cystic lesion as signs of malignancy confirmed at surgery. In the remaining 45 cases (83.4%) of branch-duct type IPMTs, no significant change was observed in the long follow-up period.

Our data suggest that pancreatic branch-duct-type intraductal papillary mucinous neoplasms grow slowly over time and a conservative approach seems to be justified in clinical management of carefully selected patients diagnosed with this disease entity; however, a larger series of patients and a longer follow-up is required to confirm the safety of this non-operatively management through observation by MRI and MRCP.
References


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