High Prevalence of Pancreatic Cysts Detected by Screening Magnetic Resonance Imaging Examinations

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BACKGROUND & AIMS: The prevalence of pancreatic cysts is not known, but asymptomatic pancreatic cysts are diagnosed with increasing frequency. We investigated the prevalence of pancreatic cysts in individuals who were screened by magnetic resonance imaging (MRI) as part of a preventive medical examination. **METHODS:** Data from consecutive persons who underwent abdominal MRI (n = 2803; 1821 men; mean age, 51.1 ± 10.8 y) at an institute of preventive medical care were included from a prospective database. All individuals had completed an application form including questions about possible abdominal complaints and prior surgery. MRI reports were reviewed for the presence of pancreatic cysts. Original image sets of all positive MRI reports and a representative sample of the negative series were re-assessed by a blinded, independent radiologist. **RESULTS:** Pancreatic cysts were reported in 66 persons (2.4%; 95% confidence interval, 1.9–3.0); prevalence correlated with increasing age ($P < .001$). There was no difference in prevalence between sexes ($P = .769$). There was no correlation between abdominal complaints and the presence of pancreatic cysts ($P = .542$). Four cysts (6%) were larger than 2 cm and 3 (5%) were larger than 3 cm. Review of the original image sets by the independent radiologist did not significantly change these findings. **CONCLUSIONS: The prevalence of pancreatic cysts in a large consecutive series of individuals who underwent an MRI at a preventive medical examination was 2.4%. Prevalence increased with age, but did not differ between sexes. Only a minority of cysts were larger than 2 cm.**

Keywords: Epidemiology; Radiologic Imaging; Pancreatic Cancer.

Pancreatic cysts are diagnosed with increasing frequency because of the increased use of advanced cross-sectional imaging such as computed tomography (CT) and magnetic resonance imaging (MRI) for different indications. Pancreatic cysts may be discovered by coincidence. Consequently, physicians are confronted with all inherent diagnostic and therapeutic dilemmas. At the same time there is a trend for "healthy" asymptomatic individuals to undergo preventive health check-ups, which may include a full-body MRI. Pancreatic cysts are a heterogeneous group of diagnostic entities that constitute a wide spectrum of congenital, inflammatory, and neoplastic lesions.[1] The former two are truly benign and do not require any further medical attention unless symptomatic, although some neoplastic cysts have malignant potential or may harbor frank malignancy. A majority of asymptomatic pancreatic cysts that are discovered incidentally are neoplasms, including intraductal papillary mucinous neoplasms and mucinous cystadenomas.[2–5]

Making a diagnosis of pancreatic cysts is not straightforward and often is a clinical challenge. One would like to prevent patients with truly benign lesions from being exposed to unwarranted investigations and surgery. Simultaneously, patients should not be withheld a justifiable resection in the case of a (pre)malignant lesion. In light of these considerations it would be helpful to have a better understanding about the true prevalence of pancreatic cysts. Little is known about the prevalence of pancreatic cysts in the general population. Reports on the subject mostly have been conducted in selected groups of patients for a wide range of medical indications using various types of imaging modalities. These include transabdominal ultrasonography, CT, and MRI, which all have a different sensitivity for cyst detection. Hence, the reported prevalence spans a wide range: from 0.21% to 24.3%.[6–10] Ideally, to estimate the prevalence of pancreatic cysts one would like to perform the most sensitive type of imaging investigation for cyst detection (MRI)[11] in an unselected sample of the general population. These data are not likely to become available owing to the high costs of such a study. The aim of our study was to approximate the ideal situation by investigating the prevalence of pancreatic cysts in a group of individuals who underwent MRI as part of a preventive medical examination without medical indication, at their own initiative and costs.

Materials and Methods

Patients

For this study we included consecutive individuals who had undergone an abdominal MRI in the Mathias Spital Hospital in Rheine, Germany, as part of a preventive medical examination. All examinations were arranged through Prescan (Hengelo, The Netherlands), a commercial agency offering preventive health check-ups, including MRI (www.prescan.nl). All individuals were Dutch, but the investigations were performed in a German hospital just across the Dutch-German border

Abbreviations used in this paper: CI, confidence interval; CT, computed tomography; HASTE, half-Fourier acquired single turbo spin-echo; MRI, magnetic resonance imaging; US, ultrasound.

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because in The Netherlands it is not legal to undergo preventive MRI investigation without a referral from a medical doctor.

We included all examinations that were performed between December 2006 and September 2008. All individuals decided to undergo screening MRI at their own initiative and costs, either without having any complaint, or because of (nonspecific) complaints that did not prompt the individual to seek regular medical advice or for which further medical work-up was not indicated according to their general physician. All individuals were older than age 18. If a person had undergone multiple MRI scans of the abdomen during the designated study period, only the first scan was included in this study. All individuals had completed an application form before undergoing abdominal MRI that included items such as medical history, physical complaints, family medical history, prior surgery, and medication use. No specific questions about the family history of pancreatic cancer were asked. This application form was discussed with a medical doctor before the MRI investigation. After the investigation the results were discussed with the individuals and, when deemed indicated by the medical doctor, the advice was given to seek further medical assistance in The Netherlands.

The study was approved by the institutional review board of the Mathias Spital Hospital and by Prescan. The requirement for informed consent was waived for this retrospective review of MRI reports. Because no informed consent was obtained we did not have the possibility to contact subjects to determine subsequent medical history after a pancreatic cyst was identified.

Magnetic Resonance Imaging Technique

All MRI examinations were performed in the Mathias Spital Hospital in Rheine, Germany, using a 1.5-T system (Avanto; Siemens, Erlangen, Germany). All patients underwent MRI before and after contrast medium administration with 0.1 mmol/kg gadopentetate dimeglumine (Magnevist; Bayer-Schering, Berlin, Germany). The following imaging sequences were acquired both coronal and axial: half-Fourier acquired single turbo spin-echo (HASTE) (echo time, 90 ms; repetition time, 1000 ms; slice thickness, 8 mm) without fat saturation; HASTE (echo time, 383 ms; repetition time, 1040 ms; slice thickness, 8 mm) without fat saturation; T1 fast low angle shot MRI (Flash-2D) before and after intravenous contrast, portal phase (echo time, 2,64 ms; repetition time, 124 ms; slice thickness, 8 mm) with fat saturation.

End Points

The primary end point was the prevalence of cystic lesions of the pancreas. Secondary end points were age distribution, sex distribution, pancreatic cyst characteristics, presence of liver or kidney cysts, presence of abdominal complaints, and medical history.

Data Collection

MRI data were originally read by radiologists at the Mathias Spital Hospital. The written reports of every MR investigation as well as the application forms were scrutinized by the investigators. All complete MRI reports were read by the investigators.

Data regarding specific features of each individual (presence of abdominal complaints, age, sex, previous medical history, family history) and cyst features (size, location, multiplicity, simple vs complex, communication with pancreatic duct, simultaneous presence of kidney and/or liver cysts) were entered in a dedicated study database.

For quality control, the original image sets of all positive MRI reports and a random sample of the negative series were re-assessed by an independent abdominal radiologist (Y.N.). MRI images were reviewed on site with the use of a picture archiving and communication system.

Statistical Analysis

Before the start of the study a power analysis was performed. With an estimated proportion of 0.018, a distance from proportion to limit of 0.005, and a confidence interval (CI) of 95%, the needed number of MRIs was 2717.

Data were recorded in a Microsoft Office Access 2007 database (Microsoft Corporation, Redmond, WA). Statistical analysis was performed using SPSS 16.0 (SPSS Inc, Chicago, IL). Descriptive statistics were used to prepare overviews of relevant data regarding demographics as well as cyst characteristics. Quantitative data are presented by median values with range or mean values with standard deviations, depending on distributional properties. For the comparison of continuous variables, appropriate t tests or nonparametric tests were used. When appropriate, the 95% CI for the difference was calculated. For categoric data, the chi-square test for trend was used. P values less than .05 were considered statistically significant. A multivariable logistic regression model was used to analyze associations between the presence of pancreatic cysts (ie, dependent variable) and sex, age, abdominal complaints, abdominal surgery, liver cysts, and kidney cysts (ie, independent variables). Variables that were associated with the presence of pancreatic cysts using univariable analysis ($P < .1$) were analyzed in the multivariable model. Odds ratios plus 95% CI were used to express the strength of the association.

Results

Retrospective Evaluation

Between December 2006 and September 2008 a total of 2803 first-time MRI scans had been performed and these were all included in this study. Mean age at the time of MRI investigation was 51.1 years (standard deviation, 10.8 y) and 65% of individuals were men. Pancreatic cysts were identified in 66 individuals, representing a prevalence of 2.4% (95% CI, 1.8–3.0). Age was associated positively (odds ratio, 1.087; 95% CI, 1.060–1.113) with the presence of pancreatic cysts. In 443 individuals between ages 18 and 39 only one cyst (0.23%) was found (95% CI, 0.04%–01.27%). In the group between ages 40 and 49 cysts were found in 12 of 893 (1.3%) individuals (95% CI, 0.8%–2.3%), and 21 individuals had cysts in the group between ages 50 and 59 (823 individuals), representing a prevalence of 2.6% (95% CI, 1.7%–3.9%). In the group between ages 60 and 69, cysts were found in 20 of 551 (3.6%) persons (95% CI, 2.4%–5.6%), and 9 cysts (10.6%) were found in the group between ages 70 and 79 (95% CI, 5.7%–18.9%). Only 8 persons were older than 80 and the oldest was 87 years. In this group 3 individuals (37.5%) had pancreatic cysts (95% CI, 13.7%–69.4%). Findings are summarized in Figure 1.

The mean age of persons with pancreatic cysts was 60.1 years (standard deviation, 10.9 y), whereas the mean age of persons without cysts was 50.9 years (standard deviation, 10.9 y) ($P <$