

## SYSTAMATIC REVIEW

# Diagnostic Accuracy of Mri in The Detection of Linear Metastasis in Patients with Pancreatic Carcinoma: A Systamatic Review

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## ABSTRACT

**Background:** Pancreatic cancer is a fatal disease with high mortality rate. Imaging has a significant and decisive interplay in the diagnosis process and in staging of the patients with carcinoma. Thus MRI detection of linear metastasis in patients with pancreatic carcinoma is of great importance.

**Objective:** The purpose of the study was to find out the diagnostic accuracy of MRI in the detection of linear metastasis in patients with pancreatic carcinoma

**Methodology:** Systematic literature search was conducted by the help of following search engines: Google scholar, PubMed, NCBI, Medline and Medscape databases from 1999 up to 2020 for names or pancreatic carcinoma, MRI, diagnostic accuracy of MRI in carcinoma, management of motion artifact in MRI, RADAR sequence for motion compensation in MRI. Only those studies were included in this review study which showed the role MRI detection in the patients with pancreatic carcinoma. Total 33 studies were selected and evaluated for the current study. All data extracted from them was further analyzed through meta-analysis.

**Results:** According to literature MRI detection technique is responsible in the detection of linear metastasis in pancreatic carcinoma. The diagnostic accuracy of the test was high with four out of five studies indicating diagnostic accuracy greater than 90%. Moreover, the sensitivity and specificity of the technique is high i.e. above 0.80 and 0.78 respectively. Thus MRI stands as the significant and accurate marker for the detection of metastasis especially in the case of pancreatic adenocarcinoma.

**Conclusion:** The reviewed literature indicated that MRI possesses high diagnostic accuracy for detection of pancreatic carcinoma. The sensitivity and specificity of MRI was also high. The results indicated that the use of MRI may help in early detection of Pancreatic Cancer.

**Key words:** Pancreatic carcinoma, Linear metastasis, Magnetic Resonance Imaging

## INTRODUCTION

Pancreatic cancer is the fourth leading cause of death in the United States and exhibits nearly 100% mortality rate (1). Median survival time is five to eight months and only 6% patients survive for 5 years. The condition is so debilitating that patients are often not eligible for any surgical treatment and only 10-15% patients show the eligibility for surgical procedures. Out of all the diagnosed cases the percentage of advanced un-resectable disease and metastatic disease is approximately same. Nearly 40% cases are of advanced un-resectable disease whereas 45% cases are of metastatic cancerous growth (2). To add to the severity of matter is the fact that majority of patients of pancreatic cancer show no symptoms of disease until the disease reaches advanced stages and no standard programs to screen high risk patients has been designed yet (1, 3). This makes the prompt diagnosis of the condition crucial to the patient health and survival. (4)

Imaging has a significant and decisive interplay in the diagnosis process and in staging of the patients with carcinoma for the purpose there are number of techniques which may be employed including computed tomography, magnetic resonance imaging and endoscopic ultrasonography. Literature background signifies the role of the all techniques in staging and diagnostic processes it shows relating the cases and employing the use of all the techniques are very necessary in the proper diagnosis and prognosis of the patients.(5) As pancreatic cancer remains as one of the most dangerous and dreadful cause of cancer death in the developed country such as United States. It has been a short estimate which reveals that approximately 0.2 million people resulted dead after prevailing the said illness in the United States in early 2000s. Therefore, its diagnostic and prognostic measures are of great importance and they need to be addressed over the great significance. In clinical practice over the globe to diagnose the pancreatic type of cancer includes CT scan, MRI and EU.<sup>6</sup> The purpose of the study hence was to find out the diagnostic accuracy of MRI in the detection of linear metastasis in patients with pancreatic carcinoma.

## METHODOLOGY

Systematic literature search was conducted by the help of following search engines: Google scholar, PubMed, NCBI, Medline and Medscape databases from 1994 up to 2020 for names or acronyms of MRI detection in linear metastasis, pancreatic carcinoma, adenocarcinoma, hepatocellular disorders. Only those studies were included in this review study which show the role of MRI in the early detection of linear metastasis and its accuracy in the pancreatic carcinoma. After independently screening the abstract and titles relevant articles, studies were included if they contain any related information of diagnostic accuracy of MRI in linear metastasis and pancreatic carcinoma. Studies investigating both adults and children together were included.

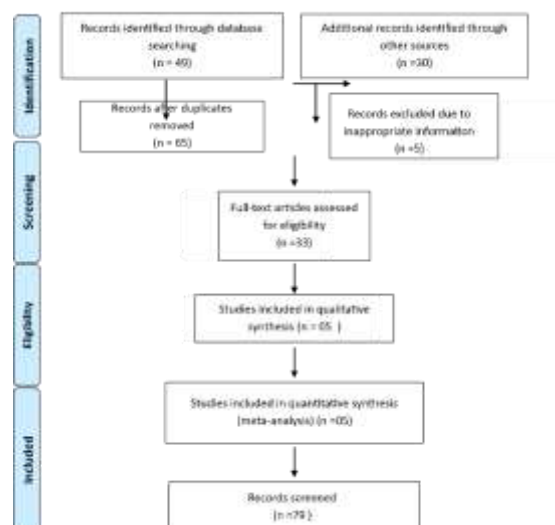


Fig 1: 4.1 PRISMA Flow Diagram of literature searched0

The minimum data set required was sample size, anatomical region of the body, its role, image quality and pathology Detection. Data were extracted from the full journal article and studies were assessed for applicability and quality. Summary statistics were calculated from the raw data given in the study if they were not reported. Numbers were read from graphs if not reported in the text of the articles. Through the significant number of sources about n=49 original studies, and related review articles were screened through hand-searching reference lists and by using the Web of Science cited reference tool. The included studies are listed in Table 1. All excluded studies are mentioned in PRISMA

flow chart. In this review study the Data analysis was performed with the help of Microsoft excel 2017 and (SPSS 24, IBM, Armonk, NY, United States of America) Statistical Package for the Social Sciences version 24. The eligible studies were first categorized on the basis of sensitivity and specificity among 33 studies, sensitivity & specificity was included in 05 studies only. The analysis of the data was performed according to the target conditions. After retrieving the sensitivity and specificity from each individual study a forest plot was formed as a graphical representation.

Table 4.1: Literature searched for the MRI diagnostic accuracy in the pancreatic carcinoma

| Study   | Year | Author           | Journal                                     | Article type     | Region   | MRI         |             |                     |
|---|------|------------------|---|------------------|----------|-------------|-------------|---------------------|
|   |      |                  |   |                  |          | Sensitivity | Specificity | Diagnostic accuracy |
| Value of magnetic resonance images in preoperative staging and resectability assessment of pancreatic cancer  | 2018 | Shufang Yang     | Journal of cancer research and therapeutics | Original article | Pancreas | 1.00        | 0.67        | 0.91(6)             |
| Differentiation of pancreatic carcinoma and mass-forming focal pancreatitis: qualitative and quantitative assessment by dynamic contrast-enhanced MRI combined with(6) diffusion-weighted imaging | 2017 | Ting-Ting Zhang  | Oncotarget                                  | Original article | Pancreas | 0.96        | 0.90        | 0.96(7)             |
| Diagnostic accuracy of MRI for preoperative staging of pancreatic carcinoma: tendency for understaging  | 2005 | TA Bley          | In Vivo                                     | Original article | Pancreas | 0.89        | 0.78        | 0.79(8)             |
| Pancreatic carcinoma: MR assessment of tumor invasion of the peripancreatic vessels   | 1995 | S Sironi         | J Comput Assist Tomogr                      | Original article | Pancreas | 0.90        | 0.88        | 0.98(9)             |
| A machine learning model for the prediction of survival and tumor subtype in pancreatic ductal adenocarcinoma from preoperative diffusion-weighted imaging  | 2019 | Georgios Kaissis | Eur Radiol Exp                              | Original article | Pancreas | 0.87        | 0.80        | 0.90(10)            |

In the included 5 studies from 1994 to 2020 it was observed that there was great significance of MRI in the diagnosis and accurate assessment of pancreatic carcinoma. Further skimming through the number of said studies show the clinical importance of the MRI in the detection and determination of pancreatic cancer among the group of patients. As sensitivity and specificity were of prime importance and were included.

The forest plot was made to analyze the data more briefly. It was seen that only two studies conducted by Shufang Yang and TA Bley exhibited specificity less than 0.8. However only one study conducted by TA Bley presented sensitivity to be less than 0.8. Whereas no study presented the diagnostic accuracy of the study to be less than 0.8 indicating that MRI has high diagnostic accuracy. Good sensitivity and specificity to rule in and rule out the condition respectively.

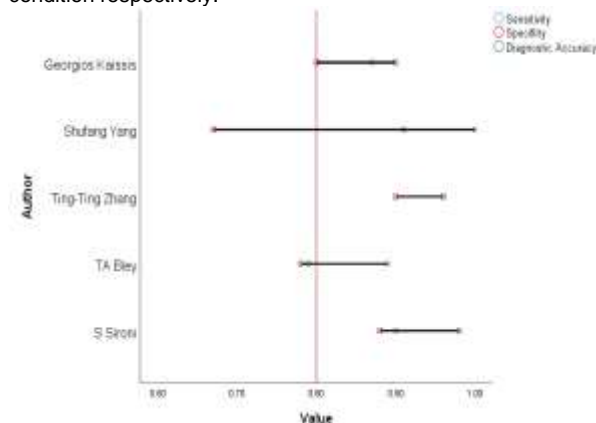


Figure II: Forest Plot

## DISCUSSION

While stomach ultrasonography might be the first screening in quite a while with expanded gastrointestinal and biliary grumblings (that may occur due to acute pancreatic disease), CT and MRI / MRCP create a more comprehensive evaluation for the finding and arrangement of pancreatic -malignancy. The decision between CT or MRI/MRCP is generally controlled by the accessibility of each condition and the expertise in reporting technology at each facility.

The main advantage of CT compared to the EUS is its capacity to give a total intestinal assessment in this way giving a greater number of subtleties than the EUS on far off metastases. In deciphering the outcomes from past investigations, it ought to be noticed that these examinations contrasted the EUS and more seasoned age CT checks.(11) Thus it fills in as a helpful corresponding assessment in CT82 or MRI/MRCP.(12)

Some indications that PET-CT can assist in the analysis of pancreatic tumors include: fringe irresistible infections, privately created illnesses and/or sicknesses with suspected metastases. Mayo et al. led a cross country audit of all patients with pancreatic malignant growth from 1996 to 2003 utilizing information from the Oregon State Cancer Registry and found that the utilization of CT examines constructs a foundation and assurance for acknowledgment. They additionally noticed that the utilization of laparoscopy, as a phase measure, was confined to those patients associated with having a metastatic illness that isn't visible to the brain.(13)

Although cost examination in the United States indicated that overall utilization of the laparoscopic stage didn't altogether build therapy costs,<sup>44</sup> ordinary utilization of laparoscopy in the peripancreatic malignant growth stage was not discovered to be beneficial.<sup>45</sup> Role of laparoscopy and laparoscopic in oncotoma ultrasonography radiation to patients with cutting edge sickness in the region by assisting with lessening the quantity of non-remedial laparotomies.(14-17) MRI detection can overall increase the

diagnostic accuracy in the pancreatic cancer patients and can be considered as effective protocol in the identification of the disease. As such there is no limitation in this study

Generally in tumor cells incomplete diffusion is attributed to hypercellularity. The degree of diffusion depends on multiple factors such as extra-cellular fibrosis, intra-cellular spaces, as well as glandular structure(18-20). focal pancreatitis was of similar homogeneous signal intensity or hyperintense to remaining pancreas while Pancreatic Carcinoma could be recognized from remaining pancreas because of hyperintense signal comparing to the remaining pancreas. The results of the research conducted by Zang et al and some previous reports(21-23) demonstrated that MRI can be valuable for detection of pancreatic lesions as well as differentiation of pancreatic cancer from focal carcinoma.(7) The results of current study supported the results of above mentioned literature as the diagnostic accuracy of MRI was found to be >0.90 for 4 out of selected studies and only one study reported the diagnostic accuracy to be 0.79.

However, analysis of data indicated the pooled sensitivity and specificity of MRI is 0.92 and 0.80 respectively. Incapability of MRI to detect small sized tumor makes it less specific to the diagnosis of cancer as small cancers are often missed. This according to W. M. Kerkx may be because of irregular signal intensity of the peri-pancreatic tissue. If peripancreatic tissue is found it becomes hard to discriminate peripancreatic tumor infiltration from desmoplastic reaction. Thus resulting in decreased specificity of the technique. (24)

## CONCLUSION

The reviewed literature indicated that MRI possesses high diagnostic accuracy for detection of pancreatic carcinoma. The sensitivity and specificity of MRI was also high. The results indicated that the use of MRI may help in early detection of Pancreatic Cancer.

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