# DWI MR imaging for dedicated staging of patients with peritoneal seeding.

Published: 25-05-2016 Last updated: 17-04-2024

Primary Objective: Prediction of PCI with DWI MRI, using the surgically determined PCI as the reference standard.Secondary Objective(s): - MR Protocol optimisation- Comparison of the diagnostic performance of DWI-MRI in assessing the PCI with the...

Ethical review	Approved WMO
Status	Pending
Health condition type	Metastases
Study type	Observational invasive

# Summary

#### ID

NL-OMON43419

**Source** ToetsingOnline

Brief title DISPERSE

## Condition

Metastases

Synonym peritoneal carcinomatosis

**Research involving** Human

## **Sponsors and support**

**Primary sponsor:** The Netherlands Cancer Institute **Source(s) of monetary or material Support:** Ministerie van OC&W

## Intervention

Keyword: MRI, peritoneal seeding, Staging

#### **Outcome measures**

#### **Primary outcome**

- Prediction of PCI with DWI MRI, using the surgically determined PCI as the

reference standard.

#### Secondary outcome

- MR Scan quality; good / moderate / poor
- Comparison of the diagnostic performance of DWI-MRI in assessing the PCI with

the results of CT (=common practice) in colorectal cancer patients.

# **Study description**

#### **Background summary**

#### 1.1 Background

Peritoneal seeding is a well-known mechanism of spread in advanced gastrointestinal and ovarian cancer. Peritoneal carcinomatosis (PC) has significant implications for not only treatment options but also prognosis; it is the second-most frequent cause of death in colorectal cancer patients after metastatic disease to the liver [ref]. The last few decades showed a revolution in the treatment of PC. Presently the prognosis of PC patients has dramatically improved and where once only palliative treatments and comfort measures were contemplated, nowadays selected patients benefit from a radical locoregional approach aiming at long-term disease control. That radical locoregional approach consists of cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (CRS-HIPEC). When a complete surgical cytoreduction can be achieved 5-years survival rates of up to 50% are reported after CRS-HIPEC. Despite this potential survival gain, CRS-HIPEC can be a morbid procedure. The morbidity rate of this procedure is about 49% with a severe complication rate of 21% [4]. The mortality rate has been reported to be ranging from 0.9% to 5.8% [4]. One out of ten patients needs a reoperation after CRS & HIPEC. The high complication rate also implies that CRS-HIPEC is not only an extensive but also a costly surgical procedure. Obviously, it is important for patients with a limited life expectancy to avoid pointless aggressive surgical procedures.

Hence, recognizing patients with a maximum risk-to-benefit ratio for the procedure is imperative. For ovarian carcinoma the most important factor for survival is the cytoreduction rate as described in a meta analysis by Bristow et al. Each 10% increase in maximal cytoreduction was associated with a 1.9 month increase in median survival time [5].

To select patients who could benefit from CRS the PCI is used in gastrointestinal cancer. The PCI combines the location and the volume of peritoneal tumor found at laparotomy at 13 abdominal and pelvic regions. The PCI is widely validated and is a quantitative prognostic indicator for long-term outcome. In order to prevent unsuccessful laparotomies surgeons and gynaecologists would like to know whether a complete cytoreduction is feasible. Currently a diagnostic laparoscopy is often used to assess the abdomen and establish the PCI. However, with this invasive procedure it is not always feasible to inspect all relevant areas in the abdomen due to formation of adhesions and or tumor. So, if preoperative imaging could accurately determine the PCI it would be a valuable, noninvasive, selection tool to select those patients who will benefit from CRS-HIPEC. For colorectal cancer patients a better selection will limit the number of ineffective procedures; for patients with advanced stage ovarian carcinoma a better diagnostic tool will enable clinicians to decide whether to perform primary cytoreductive surgery or start with neo-adjuvant chemotherapy followed by surgical cytoreduction after 3 cylcles of chemotherapy.

#### 1.2 Imaging of Peritoneal metastasis

Imaging has an important role in the assessment of PC, from the initial diagnosis to the evaluation of disease volume and distribution that may help select those patients who will benefit from CRS-HIPEC. However due to its lack of specificity and the small size of lesions the diagnosis and staging of PC presents a serious challenge for the radiologist. Therefore, the current role of imaging in the patient selection process is aimed at ruling out extraperitoneal disease involvement, assessing peritoneal disease volume and distribution as a guide for surgical planning and evaluating possible signs that may preclude the achievement of a complete cytoreduction.

#### 1.2.1 Computed Tomography

CT is routinely used for evaluating patients with PC. A meta-analysis of current literature shows a pooled sensitivity and specificity for the overall detection of PC with CT of 73% and 90%, respectively [1]. However the accuracy of CT for PC strongly depends on tumor size, site, morphology and the presence of ascites. For example, it has been shown that CT scan accuracy for the detection of peritoneal lesions varies with their location within the abdomen, being greatest in the gutters, over the free surface of spleen and liver, and less favorable in the pelvis and midabdomen. Also tumor nodule size has a major impact on sensitivity as well, ranging from 25% for lesions smaller than 0.5 cm to 90% for nodules more than 5 cm in size[6].

In addition de Bree et al. reported a wide interobserver variability among radiologists in the interpretation of CT scans of patients with peritoneal

carcinomatosis of colorectal origin [7]. The role of CT is very limited in the prediction of the PCI with a steady underestimation of disease. Low et al. found that in a patient group with a surgical median PCI score of 33, the median PCI score of CT was 15 [3]. Obviously CT cannot be used as a reliable selection tool.

#### 1.2.2 Diffusion-weighted MR imaging

Magnetic resonance imaging (MRI) uses the effect of a strong magnetic field on tissue protons spin motion, resulting in a superior soft tissue contrast compared with CT. DWI is a non-invasive functional imaging technique that measures the extracellular movement of water protons. In tissues with a normal cellularity (most healthy soft tissues) or low cellularity (fluids), there is ample extracellular space and water protons can diffuse relatively freely. This movement of water protons causes a signal loss on diffusion-weighted images. In tissues with increased cellularity (tumour), the extracellular space is limited and the movement of water protons is restricted. As a result the signal on DWI remains high. Because DWI suppresses the signal in all normal tissues, the high signal of malignant tissues stands out which makes DWI a highly promising tool for detection of malignant tumours. DWI is a well-established technique for brain imaging, in particular for the detection of brain ischemia. Currently, the potential value of DWI for extracranial imaging is widely being investigated with a specific focus on cancer imaging. The value of DWI for malignant tumour detection has been demonstrated in several cancer types including prostate cancer, liver tumours, head & neck tumours and gynaecological malignancies.

In a comparative study reported by Low [2] using CT and MRI, the latter showed a significantly improved sensitivity for depicting tumor involving the peritoneum and the intestinal tract. The same author reports on the ability of MRI to depict subtle peritoneal implants, an important feature that constitutes a weakness of CT scanning. Moreover, in patients with moderate to high-volume ascites, it allows for a good evaluation of the parietal or visceral peritoneum covered by fluid, which is not possible with a CT scan [8]. In a small study patients were categorized as small volume tumor (PCI 0-9), moderate volume (PCI 10-20), and large volume (PCI > 20) according to their surgical PCI [3]. MRI could correctly categorize 91% of the patients (in contrast to CT, which could correctly categorize 50%).

This means that DWI MRI could play an important role in the diagnosis and therapeutic management of patients with colorectal and gynecological malignancy, however more prospective research is needed.

#### Study objective

Primary Objective:

Prediction of PCI with DWI MRI, using the surgically determined PCI as the reference standard.

#### Secondary Objective(s):

4 - DWI MR imaging for dedicated staging of patients with peritoneal seeding. 2-05-2025

- MR Protocol optimisation

- Comparison of the diagnostic performance of DWI-MRI in assessing the PCI with the results of CT (=common practice) in colorectal cancer.

#### Study design

This is a prospective observational cohort study and will be conducted in The Netherlands Cancer Institute. In six months 20 patients scheduled for cytoreductive surgery for either colorectal carcinoma with peritoneal carcinomatosa or advanced stage ovarian carcinoma will be included. Patients with colorectal carcinoma will subsequently be treated with HIPEC. In addition to the standard diagnostic work-up (CT), patients will receive an additional MRI scan 0-14 days prior to their scheduled surgery.

The goal of this study is to evaluate the diagnostic performance of DWI MRI and CT for predicting the PCI.

#### Study burden and risks

For the study population, this study has no direct benefits. However, the results of this study will help improve the performance of MRI for staging and response evaluation in patients with peritoneal cancer, which can have a substantial impact on future treatment planning and prognosis as described above.

The burden for patients exists of:

• The total time of MR imaging will be 35 minutes. MRI does not have any radiation exposure.

• Gadolinium and Buscopan will be administrated intravenously. A potential side effect that can occur as a result of the administration is an allergic reaction. Although it is known that the side effects of Gadolinium /Buscopan are limited and occur in only a very limited number of patients, the possibility of serious or life-threatening anaphylactic or anaphylactoid reactions, including cardiovascular, respiratory and/or cutaneous manifestations, should always be considered (as with other contrast media). Furthermore, caution should be exercised in patients with renal insufficiency due to the possibility of further deterioration in renal function (there have been reports of nephrogenic systemic fibrosis associated with the use of some gadolinium-containing contrast agents in patients with acute or chronic severe renal impairment). Therefore, only patients with a GFR (glomerular filtration rate) of >30 will be included, as is the recommendation for the clinical use of Gadolinium.

# Contacts

Public The Netherlands Cancer Institute

Plesmanlaan 121 Amsterdam 1066 CX NL Scientific The Netherlands Cancer Institute

Plesmanlaan 121 Amsterdam 1066 CX NL

# **Trial sites**

# **Listed location countries**

Netherlands

# **Eligibility criteria**

Age Adults (18-64 years) Elderly (65 years and older)

## **Inclusion criteria**

- Patients already scheduled for cytoreductive surgery +/- HIPEC procedure with histology proven colorectal or ovarian cancer

- Age >18 years

- Written informed consent

# **Exclusion criteria**

- contraindication for MRI (metal) or MRI contrast agent (Gadolinium)
- contraindicaties for Buscopan
- allergie voor ananassap
- age < 18 years
- pregnant women

# Study design

## Design

Study type: Observational invasive		
Masking:	Open (masking not used)	
Control:	Uncontrolled	
Primary purpose:	Diagnostic	

## Recruitment

NL	
Recruitment status:	Pending
Start date (anticipated):	01-04-2016
Enrollment:	20
Туре:	Anticipated

# **Ethics review**

Approved WMO Date:	25-05-2016
Application type:	First submission
Review commission:	PTC Stichting het Nederlands Kanker Instituut - Antoni van Leeuwenhoekziekenhuis (Amsterdam)
Approved WMO	
Date:	29-03-2017
Application type:	Amendment
Review commission:	PTC Stichting het Nederlands Kanker Instituut - Antoni van Leeuwenhoekziekenhuis (Amsterdam)

# **Study registrations**

# Followed up by the following (possibly more current) registration

No registrations found.

7 - DWI MR imaging for dedicated staging of patients with peritoneal seeding. 2-05-2025

# Other (possibly less up-to-date) registrations in this register

No registrations found.

## In other registers

Register

ССМО

ID NL56083.031.16