



## Symptoms, signs and radiologic findings in patients having reoperative surgery for malignant peritoneal mesothelioma

M.D. Llanos<sup>a</sup>, P.H. Sugarbaker<sup>b,\*</sup>

<sup>a</sup> Quiron Hospital, Department of General and Digestive Surgery, Torrevieja, Alicante, Spain

<sup>b</sup> Program in Peritoneal Surface Malignancy, MedStar Washington Hospital Center, Washington, DC, USA

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### Abstract

**Background:** A reasonable estimate is that 50% of patients treated with cytoreductive surgery (CRS) and perioperative chemotherapy for malignant peritoneal mesothelioma will recur. Recognition of this recurrence and knowledgeable selection for additional surgical intervention is important in improving survival of patients who progress.

**Material and methods:** Patients treated for malignant peritoneal mesothelioma with CRS and perioperative chemotherapy were placed in follow-up for assessment of symptoms and signs and radiologic abnormalities by CT. The data were prospectively maintained and retrospectively reviewed.

**Results:** From a database of 130 patients with malignant peritoneal mesothelioma, 38 patients who had 50 reoperations with disease recurrence that was histologically confirmed were studied. The median time to first recurrence was 14 months with a range of 3–102. Considering 50 reoperative events the most common symptoms or signs were abdominal pain (40%) and abdominal distention (34%). The most common radiologic finding was a tumor mass (56%). Patients with an abdominal or pelvic mass had a reduced prognosis ( $p = 0.006$ ) and patients with an absence of radiologic abnormalities had an improved survival ( $p = 0.047$ ).

**Conclusions:** In patients having reoperative surgery, symptoms, signs and radiologic abnormalities associated with recurrent (progressive) malignant peritoneal mesothelioma are abdominal pain, abdominal distention, and a tumor mass. An abdominal or pelvic mass was associated with a reduced prognosis and an absence of radiologic abnormalities with an improved prognosis.

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**Keywords:** Reoperative surgery; HIPEC; Cytoreductive surgery; Concerning radiologic features; Second-look surgery; CT

### Introduction

Malignant peritoneal mesothelioma is a rare disease that is confined to the abdomen and pelvis throughout its natural history. Great improvements in the results of treatment have been seen as a result of aggressive local-regional treatment strategies employing cytoreductive surgery and perioperative chemotherapy regimens. The chemotherapy is used primarily within the peritoneal space with heat in order to achieve an optimal result. The results of treatment have been reported by several groups.<sup>1–3</sup> Also, reoperative surgery for this disease has been studied by our group and determined to be of benefit.<sup>4</sup> The symptoms, signs and

radiologic findings of patients with primary malignant mesothelioma have been determined.<sup>5</sup> However, the clinical features associated with recurrent malignant peritoneal mesothelioma have not been previously studied. The purpose of this manuscript was to establish the time to recurrence and patients' symptoms, signs and radiologic findings that were associated with a reoperative event. Also, these clinical features were analyzed regarding their impact on prognosis.

### Material and methods

All malignant epithelial peritoneal mesothelioma patients who had treatment at this institution were entered into a prospective database. Sarcomatoid, biphasic, cystic, and papillary histologies were not included. Their initial

\* Corresponding author. Washington Cancer Institute, 106 Irving St., NW, Suite 3900, Washington, DC 20010, USA. Fax: +1 (202) 877 8602.  
E-mail address: [Paul.Sugarbaker@medstar.net](mailto:Paul.Sugarbaker@medstar.net) (P.H. Sugarbaker).

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intervention at this institution was cytoreductive surgery as described elsewhere.<sup>6</sup> In all patients the surgical intervention was accompanied by perioperative hyperthermic intraperitoneal chemotherapy (HIPEC). In the first 42 patients the perioperative chemotherapy was HIPEC only. In the next 59 patients early postoperative intraperitoneal chemotherapy (EPIC) was added to HIPEC. In the next 30 patients bidirectional adjuvant normothermic chemotherapy (BANC) for 6 cycles was added to HIPEC and EPIC.<sup>3</sup> All 130 patients had an adequate cytoreduction. All patients had treatment with pemetrexed and cisplatin. Additional systemic chemotherapy was not given prior to the first, second, or third repeat intervention.

Patient follow-up was a 6 monthly visit to a surgeon or medical oncologist for symptom review and physical examination for 5 years and then yearly for another 5 years. A CT scan with oral and intravenous contrast was performed at the same intervals.

Time to recurrence, symptoms, signs and radiologic findings were prospectively stored and then tabulated and analyzed. Patients included in this study are those with histologically-confirmed recurrence of malignant peritoneal mesothelioma at the time of a repeat intervention. Permission from the institutional review board to collect and analyze data on these patients was obtained.

To summarize the radiologic findings, the official radiologic reports were extracted for the following entities: tumor masses, ascites, abdominal wall or diaphragmatic irregularities, bowel obstruction, perihepatic irregularities, bladder compression or pelvic irregularities, perisplenic irregularities, extrinsic small bowel compression, cystic structures, mesenteric thickening, lymph node enlargement, pleural effusion, calcifications, pleural nodule or no radiologic findings.<sup>7,8</sup>

CT scans were subjected to an interpretative classification according to the most prominent findings. Class 0 CT showed no predominant findings. In class 1 CT, ascites was the predominant finding. In class 2 CT, discrete tumor masses limited in number were imaged. In class 3 CT, there were mesenteric masses or nodular thickening of the mesentery. Fig. 1 presents examples of class 1, 2, and 3 interpretative radiologic findings.

In some patients the diagnosis of recurrent disease was not determined by a single clinical evaluation or CT but rather a series of investigations. For these data the clinical evaluation for symptoms and signs and the CT most closely related in time to the reoperation was used to accumulate data.

Demographic characteristics of recurrent cases are shown as percentages or as mean values. Continuous data

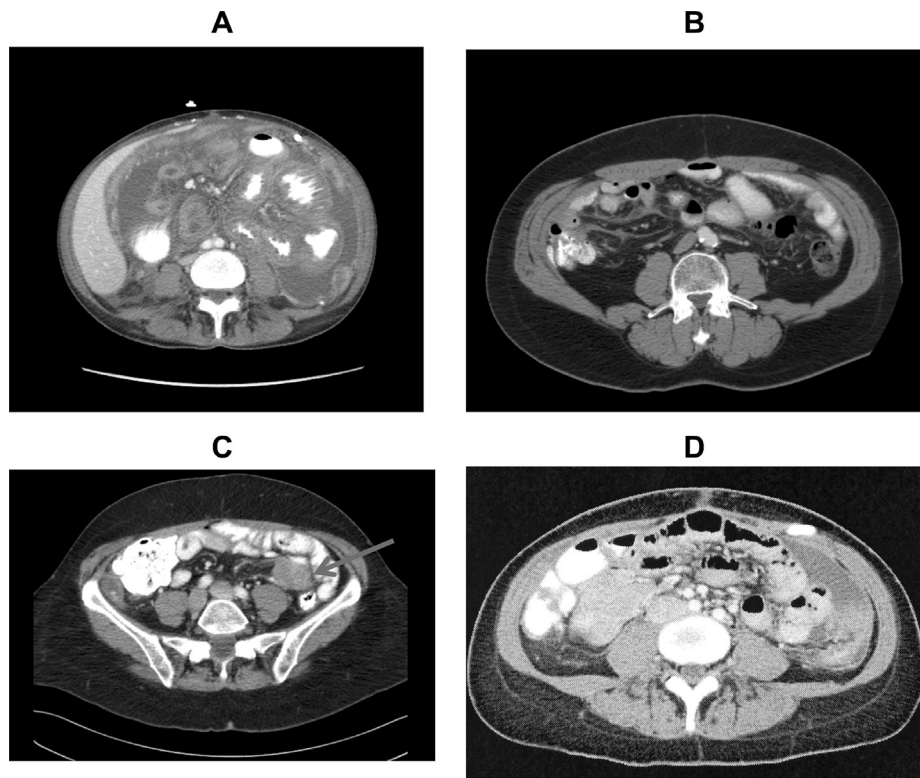


Figure 1. Interpretative radiologic findings of recurrent malignant peritoneal mesothelioma by CT. A – Class 1 CT shows a gross ascites accumulation throughout the abdomen and pelvis. B – Class 1 CT shows a small volume of ascites between folds of small bowel mesentery in the terminal ileum. C – Class 2 CT shows a discrete left lower quadrant mesenteric soft tissue mass. D – Class 3 CT shows multiple mesenteric nodules and a mass present in the left paracolic sulcus.

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