

Chemosaturation via percutaneous hepatic artery perfusion and hepatic vein isolation for primary or metastatic liver cancer

Interventional procedures guidance

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[nice.org.uk/guidance/ipg488](https://www.nice.org.uk/guidance/ipg488)

Your responsibility

This guidance represents the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, healthcare professionals are expected to take this guidance fully into account. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Commissioners and/or providers have a responsibility to implement the guidance, in their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity, and foster good relations. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should [assess and reduce the environmental impact of implementing NICE recommendations](#) wherever possible.

1 Recommendations

- 1.1 Current evidence on the efficacy of chemosaturation via percutaneous hepatic artery perfusion and hepatic vein isolation for primary or metastatic liver cancer ('hepatic chemosaturation') is limited in quality and quantity. With regard to

safety, there is a significant incidence of serious adverse effects. Therefore, this procedure should only be performed within the context of research, which may take the form of observational studies.

- 1.2 Patient selection should be done by an appropriate multidisciplinary team.
- 1.3 Hepatic chemosaturation should only be carried out by clinicians with specific training in its use and in techniques to minimise the risk of adverse effects from the procedure.
- 1.4 Research should document indications for treatment, details of patient selection and details of adjuvant and prior treatments. Outcome measures should include complications, survival and quality of life. Data from well-designed trials comparing the procedure against other forms of management would be particularly useful, but prospective observational studies may also be of value.

2 Indications and current treatments

- 2.1 The most common types of primary liver cancer are hepatocellular carcinoma (also known as hepatoma) and cholangiocarcinoma. However, liver cancer occurs more often as a result of metastases from sites such as the lung, colon, stomach, and eye (particularly ocular melanoma).
- 2.2 Treatment for primary or metastatic liver cancer depends on the location and stage of the cancer and how well liver function is preserved. Treatment options include surgical resection, thermal ablation, systemic chemotherapy, transarterial chemoembolisation, and selective internal radiation therapy. Liver transplantation may be appropriate for some patients. In patients with primary liver cancer, surgical removal with curative intent may be possible. For most patients with liver metastases, treatment with curative intent is not possible.
- 2.3 Regional hepatic arterial delivery of high-dose chemotherapy with isolated hepatic perfusion used to be done using open surgical techniques, which carried a risk of significant morbidity and mortality. It is now done percutaneously: this means that the procedure is less invasive and it can also be repeated.

3 The procedure

- 3.1 The aim of chemosaturation via percutaneous hepatic artery perfusion and hepatic vein isolation is to treat liver cancer by delivering a high dose of chemotherapy directly into the hepatic artery. As the blood leaves the liver it is diverted out of the body through a catheter and filtered to reduce the level of chemotherapy drug before being returned to the circulation. This allows high doses of chemotherapy to be used, which would otherwise not be tolerated because of severe systemic side effects.
- 3.2 The procedure is usually done with the patient under general anaesthesia. Full anticoagulation is needed throughout. An infusion catheter is inserted into the femoral artery and guided into the hepatic artery. The femoral vein is then cannulated and a special multi-lumen, double-balloon catheter is inserted into the inferior vena cava, and across the hepatic veins. The balloons are inflated and positioned in such a way that all the blood leaving the liver (via the hepatic veins) enters this catheter, rather than the systemic circulation. High doses of a chemotherapy drug are then infused directly into the liver via the hepatic artery infusion catheter over a period of approximately 30 minutes. During this time, blood leaving the liver passes through an extracorporeal filtration system that removes most of the chemotherapy drug before the blood is returned to the circulation via a catheter in the internal jugular vein.
- 3.3 The haemodynamic status of the patient changes significantly during this procedure, and this will need management by the anaesthetic team and support from the perfusion scientist.

4 Efficacy

This section describes efficacy outcomes from the published literature that the Committee considered as part of the evidence about this procedure. For more detailed information on the evidence, see the [interventional procedure overview](#).

- 4.1 A case series of 25 patients with advanced hepatocellular carcinoma (HCC) treated by chemosaturation via percutaneous hepatic artery perfusion and hepatic vein isolation (hepatic chemosaturation) reported 1-year and 5-year survival rates of 86% and 47% respectively (n=22). A case series of 28 patients with HCC treated by hepatic chemosaturation (included in a report of

46 patients with different types of cancer) reported 1-year and 5-year survival rates of 68% and 40% respectively. Median survival for these patients was 16 months. A case series of 10 patients with metastatic melanoma or sarcoma reported that median overall survival from time of first hepatic chemosaturation treatment was 8.7 months. At a median follow-up of 11.5 months, 40% (4/10) of patients were still alive.

- 4.2 A case series of 28 patients with primary or metastatic liver cancer treated by hepatic chemosaturation reported an overall radiographic response rate of 30% (8/27): this included 2 complete responses (both in patients with metastatic ocular melanoma) and 6 partial responses. The case series of 25 patients with advanced HCC reported complete remission in 45% (10/22) of patients, partial response in 41% (9/22), stable disease in 9% (2/22) and progressive disease in 5% (1/22). The median duration of response was 16 months (range 4–93 months). A case series of 46 patients reported tumour response for 28 patients with HCC: 19% (5/27) of patients had a complete response, 44% (12/27) had a partial response, 26% (7/27) had stable disease and 11% (3/27) had progressive disease. A case series of 23 patients with primary or metastatic liver cancer reported a 'significant response' in 10% (2/21) of patients, stable disease in 10% (2/21) and progression of hepatic tumours in 81% (17/21). The case series of 10 patients reported that 90% (9/10) patients had stable disease or a partial response to treatment and the median hepatic progression free survival was 240 days.
- 4.3 The specialist advisers listed key efficacy outcomes as progression-free and overall survival, and time to disease progression.

5 Safety

This section describes safety outcomes from the published literature that the Committee considered as part of the evidence about this procedure. For more detailed information on the evidence, see the [interventional procedure overview](#).

- 5.1 Adverse events resulting in death were reported in 4% (5/121) of patients in a study of 121 patients (51 patients in a phase 2 study and 70 patients in a phase 3 randomised controlled trial). The causes of death were gastrointestinal haemorrhage due to a ruptured right hepatic artery, hepatic failure in a patient whose liver tissue was more than 90% tumour, gastric perforation,

streptococcal sepsis and neutropenia. Death was reported in 2 patients in the case series of 46 patients: in both patients, hepatic arterial thrombosis occurred that was associated with infection caused by the catheter system. Death was reported in post-marketing surveillance in 1 patient out of 32 patients treated with this procedure. The patient died of a spontaneous retroperitoneal haemorrhage within 24 hours of the procedure.

- 5.2 Serious neutropenia was reported in 59% (71/121) of patients in the study of 121 patients. Complicated neutropenia (febrile neutropenia or neutropenic infection) was reported in 21% (25/121) of patients and was the underlying cause of death in 2 patients (described in section 5.1). Thrombocytopenia was reported in 80% (97/121) of patients, 27 of whom were readmitted, primarily for platelet transfusions. It caused bleeding events in 4 patients, including intracranial, retinal, vaginal and gastrointestinal haemorrhage.
- 5.3 Cardiovascular events classified as grade 3 or 4 were reported in 17% (21/121) of patients in the study of 121 patients; 13 of these occurred at the time of the procedure and 7 occurred within 30 days of the procedure.
- 5.4 Gastrointestinal events (including gastritis, ulceration, perforation, bleeding and gallbladder-related events) classified as grade 3 or 4 were reported in 11% (13/121) of patients in the study of 121 patients.
- 5.5 Haemorrhage occurred in 13% (16/121) of patients in whom 8 were classified as grade 3 or 4, in the study of 121 patients. Intracranial haemorrhage occurred in 2 patients with brain metastases; 1 of these patients died.
- 5.6 Hepatic events were reported in 44% (53/121) of patients in the study of 121 patients. Hepatic failure was the cause of death in 1 patient (described in section 5.1).
- 5.7 The specialist advisers listed anecdotal adverse events as hepatotoxicity, haemodynamic instability during the procedure, bleeding, and death from unexpected disseminated intravascular coagulation.

6 Committee comments

- 6.1 The Committee found interpretation of the published evidence difficult because reports included heterogeneous groups of patients with different types of primary and secondary tumours, and the procedure had been used in the context of a variety of adjuvant treatments.
- 6.2 The Committee noted that response of liver tumours on imaging is not necessarily associated with improvements in quality of life or survival: this underpinned the recommendations in [section 1.4](#) for these to be included as outcome measures in any future publications.
- 6.3 The Committee was advised that the filter technology used to exclude chemotherapy agents from the systemic circulation is improving.
- 6.4 The Committee recognised that hepatic saturation is typically considered for patients who have a poor prognosis with limited treatment options. It considered that this made information from well-conducted trials on the procedure particularly important to ensure that these patients fully understand the balance of possible benefit and potential harm from this procedure.
- 6.5 The Committee noted several consultation comments regarding the use of this procedure for metastatic ocular melanoma: this is an uncommon condition for which there are few treatment options. The Committee considered that the initial results from use of this procedure on small numbers of patients with metastatic ocular melanoma justified further research for this condition. It noted that ocular melanoma is included in the International Rare Cancers Initiative, which supports the development of international clinical trials for rare cancers.

7 Further information

- 7.1 For related NICE guidance see the [NICE website](#).

Information for patients

NICE has produced information on this procedure for patients and carers ([Information for the public](#)). It explains the nature of the procedure and the guidance issued by NICE, and has been written with patient consent in mind.

About this guidance

NICE interventional procedures guidance makes recommendations on the safety and efficacy of the procedure. It does not cover whether or not the NHS should fund a procedure. Funding decisions are taken by local NHS bodies after considering the clinical effectiveness of the procedure and whether it represents value for money for the NHS.

This guidance was developed using the NICE [interventional procedures guidance process](#).

We have produced a [summary of this guidance for patients and carers](#). Information about the evidence the guidance is based on is also [available](#).

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Endorsing organisation

This guidance has been endorsed by Healthcare Improvement Scotland.

Accreditation

