

# Selective internal radiation therapy for primary hepatocellular carcinoma

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**NICE interventional procedure guidance 460**

[guidance.nice.org.uk/ipg460](http://guidance.nice.org.uk/ipg460)

NICE has accredited the process used by the NICE Interventional Procedures Programme to produce interventional procedures guidance. Accreditation is valid for 5 years from January 2010 and applies to guidance produced since January 2009 using the processes described in the 'Interventional Procedures Programme: Process guide, January 2009' and the 'Interventional Procedures Programme: Methods guide, June 2007'. More information on accreditation can be viewed at [www.nice.org.uk/accreditation](http://www.nice.org.uk/accreditation)



## 1 Guidance

- 1.1 Current evidence on the efficacy and safety of selective internal radiation therapy (SIRT) for primary hepatocellular carcinoma is adequate for use with normal arrangements for clinical governance, consent and audit. Uncertainties remain about its comparative effectiveness, and clinicians are encouraged to enter eligible patients into trials comparing the procedure against other forms of treatment.
- 1.2 Patients with primary hepatocellular carcinoma should be selected for treatment by SIRT or for entry into trials by a multidisciplinary hepatobiliary cancer team.
- 1.3 SIRT should only be carried out by clinicians with specific training in its use and in techniques to minimise the risk of side effects from the procedure.
- 1.4 Clinicians should enter details about all patients undergoing SIRT for primary hepatocellular carcinoma onto the [UK SIRT register](#). They should audit and review clinical outcomes locally and should document them and consider their relationship to patient characteristics.

## 2 The procedure

### 2.1 *Indications and current treatments*

- 2.1.1 Hepatocellular carcinoma is the most common type of primary liver cancer.
- 2.1.2 The choice of treatment for primary hepatocellular carcinoma depends on a number of factors, including the exact location and stage of the cancer, and the patient's liver function. The aim of treatment is normally to slow progression with a view to improving quality of life and prolonging survival. In some patients surgical removal with curative intent may be possible: this may sometimes be achieved by downstaging the tumour using other treatment modalities first. Treatment options include chemotherapy (intravenous or by hepatic artery infusion), surgical excision, transarterial chemo-embolisation (TACE) and radiofrequency ablation.

## 2.2 Outline of the procedure

- 2.2.1 Selective internal radiation therapy (SIRT) for primary hepatocellular carcinoma involves infusion of microspheres loaded with yttrium-90, which aims to deliver radiation directly into the tumour, minimising the risk of radiation damage to healthy surrounding tissues.
- 2.2.2 Before undertaking the treatment, a nuclear medicine liver-to-lung shunt study is carried out to assess the risk of radioactive microspheres causing lung damage. Radiographic imaging and selective coil embolisation of arteries to the stomach and duodenum are also commonly carried out.
- 2.2.3 Using local anaesthesia, radioactive microspheres that are designed to lodge in the small arteries are injected into branches of the hepatic artery, usually by a percutaneous femoral approach.
- 2.2.4 The procedure may be repeated depending on the response.

Sections 2.3 and 2.4 describe efficacy and 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 [overview](#).

## 2.3 Efficacy

- 2.3.1 A non-randomised comparative study of 86 patients, with 43 treated by SIRT and 43 treated by TACE, reported overall median survival of 42 months in the SIRT group compared with 19 months in the TACE group ( $p=0.008$ ). A case series of 325 patients reported overall median survival was 12.8 months; this varied significantly by disease stage (Barcelona Clinic Liver Cancer [BCLC] stage A: 24.4 months; BCLC stage B: 16.9 months; BCLC stage C: 10 months).
- 2.3.2 The non-randomised comparative study of 86 patients reported a partial response (assessed using World Health Organization [WHO] criteria) in 61% (26/43) of patients treated by SIRT (median follow-up 34 months) and 37%

(13/35) of patients treated by TACE (median follow-up 52 months). This difference was not significant ( $p=0.07$ ).

- 2.3.3 A non-randomised comparative study of 245 patients, with 123 treated by SIRT and 122 treated by TACE, reported an overall response rate (assessed using WHO criteria) in 49% (60/123) of patients treated by SIRT (median follow-up 23 months) and 36% (44/122) of patients treated by TACE (median follow-up 33 months) ( $p=0.05$ ).
- 2.3.4 The non-randomised comparative study of 86 patients reported downstaging from stage T3 to stage T2 in 58% (25/43) of patients in the SIRT group and 31% (11/35) of patients in the TACE group at a 'median time to downstaging was within 6 months' ( $p=0.02$ ).
- 2.3.5 A case series of 291 patients treated by SIRT reported that 12% (34/291) of patients underwent treatment with curative intent: 32 went on to have liver transplants and 2 had resection of their tumours (median follow-up 31 months).
- 2.3.6 A case series of 35 patients treated by SIRT reported that 8 patients were downstaged and underwent liver transplantation (timing ranged from 12 days to 210 months after treatment).
- 2.3.7 The non-randomised comparative study of 245 patients reported a significantly longer median time to progression of 13.3 months in patients treated by SIRT compared against 8.4 months in patients treated by TACE ( $p=0.05$ ).
- 2.3.8 A non-randomised comparative study of 28 patients, with 14 treated by SIRT and 14 treated by cisplatin, reported health-related quality of life measured on the Functional Assessment of Cancer Therapy – Hepatobiliary (FACT-Hep) questionnaire (scored on a scale of 0–4; higher score indicating better quality of life or fewer symptoms). The overall health-related quality of life score was 47 for the SIRT group ( $n=9$ ) and 52 for the cisplatin group ( $n=5$ ) at 6-month follow-up. This difference was reported as not significant ( $p$  value not reported).
- 2.3.9 The Specialist Advisers listed efficacy outcomes as tumour response, overall survival, quality of life, increased time to progression, downsizing or

downstaging to potentially curative treatments, and bridging to liver transplantation.

## 2.4 Safety

- 2.4.1 Death within 30 days was reported in 7% (2/27) of patients treated by SIRT and in 9% (4/44) of patients treated by chemo-embolisation in a non-randomised comparative study of 71 patients.
- 2.4.2 Radiation pneumonitis was reported in 4 patients between 1 and 6 months after treatment by SIRT (a scan to determine lung shunting had been performed before SIRT) in a case series of 80 patients. All patients were treated by steroids. Three patients died of progressive respiratory failure and 1 from progressive cancer.
- 2.4.3 Ulceration caused by radiation was reported in 11% (3/27) of patients who were treated by SIRT (after prophylactic coil embolisation of the gastroduodenal arteries) and gastritis and/or temporary ulceration was reported in 20% (9/44) of patients treated by chemo-embolisation in the non-randomised comparative study of 71 patients. Two patients in the SIRT group were treated by subtotal gastrectomy; there were no further details on the other patient (median follow-up 6 months).
- 2.4.4 Cholecystitis reported as 'possibly related to treatment' occurred in 2 patients in the case series of 80 patients treated by SIRT (both treated by emergency cholecystectomy 21 and 243 days after treatment).
- 2.4.5 Radiation-induced biliary stricture was described in a case report. The patient became progressively jaundiced and fatigued, with mild or moderate bilirubin toxicity (timing not reported).
- 2.4.6 Bone marrow suppression resulting in transient thrombocytopenia was reported 1 month after SIRT in a case report.
- 2.4.7 Post-embolisation syndrome was reported in 60% of patients in both the SIRT and TACE groups (absolute numbers not reported) in the non-randomised

comparative study of 86 patients. The symptoms (fatigue and transient non-specific flu-like symptoms) lasted 7 to 10 days in the SIRT group (no further details).

- 2.4.8 The Specialist Advisers listed additional anecdotal adverse events as fibrosis and skin ulceration; and additional theoretical adverse events as liver failure, portal hypertension, and radiation-induced liver disease.

## **2.5 Other comments**

- 2.5.1 The Committee noted wide variation in the published evidence about prior and adjunctive treatments that patients received. This made interpretation of the effect of SIRT difficult.
- 2.5.2 The Committee noted that safety outcomes from older published studies may not reflect current practice in which prophylactic coil embolisation is used.

## **3 Further information**

- 3.1 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 procedure 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. It is for healthcare professionals and people using the NHS in England, Wales, Scotland and Northern Ireland, and is endorsed by Healthcare Improvement Scotland for implementation by NHSScotland.

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

We have produced a [summary of this guidance for patients and carers](#).

### **Your responsibility**

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

Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their 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.

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