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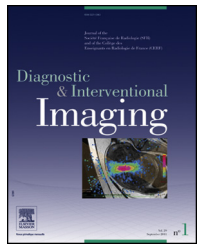

ORIGINAL ARTICLE / *Gastrointestinal imaging*

Medico-economic study of the management of hepatocellular carcinoma by chemo-embolization

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Medico-economic analysis;
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Abstract
Purpose: This study has two aims. The first is to compare conventional lipiodol chemo-embolization (Trans Arterial Chemo-Embolization — TACE) to one using pre-loaded particles (Trans Arterial Chemo-Embolisation-Drug Eluted Bead — TACE-DEB) using a cost minimization study. The second is to define the fundable nature of TACE-DEB and the conditions under which it is cost-effective.
Materials and methods: Retrospective study of patients treated by chemo-embolization ($n = 31$: TACE; $n = 32$: TACE-DEB) during the year 2010. The cost minimization study was conducted from the hospital perspective. Direct medical costs were calculated and compared using the readjusted ENCC (National Studies of Costs by Common Methodology) method. The affordability of the two techniques and definition of a cost-effective hypothesis (break-even point) were also established.
Results: All DRGs combined, lengths of stay (TACE: 4.90 ± 3.36; TACE-DEB: 5.03 ± 3.36) does not change significantly. An average upper mean cost for TACE-DEB is described (TACE: 2869.05 €; TACE-DEB: 3960.10 €). The affordability calculations in the study show that, overall, TACE-DEB can be funded regardless of DRG. A ratio of 1.3 procedures using the conventional (TACE) method would enable TACE-DEB procedures to be funded.
Conclusion: This medico-economic analysis demonstrates that the TACE-DEB procedure is fundable.

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Liver cancer, or hepatocellular carcinoma (HCC), is the third leading cause of cancer deaths throughout the world [1]. It is the fifth most common cancer in the world and has an estimated incidence of approximately 700,000 new cases annually [2]. Because it is paucisymptomatic resulting in late diagnosis, only a third of patients suffering from HCC are eligible for curative treatment. Clinicians offer palliative care with embolization of the feeder vessels for two-thirds of inoperable, non-metastatic HCC (Child A-B, intermediary stage by the BCLC [Barcelona Clinic Liver Cancer] classification [1,2]. Two embolization approaches are currently available using interventional radiology techniques. The first is based on the principle of injecting a chemotherapy emulsified in lipiodol followed by vascular embolization with resorbable particles. This is the conventional technique or TACE (Trans Arterial Chemo-Embolization). The second more recent technique uses non-resorbable microspheres loaded with cytotoxic agents, usually doxorubicin. These are carried out in a single interventional stage and are commonly called TACE-DEB (TACE-Drug Eluting Beads).

Both techniques have been shown to offer similar efficacy in terms of patient's length of survival [3]. TACE-DEB has significant technical advances as it does not require extemporaneous preparation; light anesthesia can be given and liver function is protected by targeted chemo-embolization. Access to this latest technique in healthcare establishments is currently still limited, particularly because of a lack of specific reimbursement by the health insurance system. The economic and organizational landscape of the healthcare system in France changed greatly in 2004 with the hospital funding reforms and introduction of activity based tariffs (TAA) (law no. 2003-1199 of 18 December 2003). As such, healthcare establishments are funded by their activity (type and volume of procedures) by amounts linked to the hospital stays (SRG: Stay Reference Group). In parallel, and in order to allow access to expensive new medicinal products and devices (MD), a list of reimbursable products in addition to the SRG was introduced. This system is limited in terms of the time delay to approve new procedures and devices, particularly new technological and therapeutic developments such as the TACE-DEB technique. The cost of this new technique is therefore only partially covered by the stay tariff.

As TACE-DEB and TACE are similarly effective, and in view of the technical advantages of TACE-DEB and its lack of reimbursement we set out to conduct a medico-economic study to support healthcare establishments in making decisions.

We have carried out a retrospective medico-economic cost minimization analysis to establish the least expensive chemo-embolization technique from the hospital's perspective [4]. The cost minimization analysis is the main aim of this study. In parallel, a secondary objective was to establish whether or not chemo-embolization was fundable for the establishment, based on a affordability analysis and measurement of the break-even point.

Materials and methods

Patients

This retrospective study was carried out on patients suffering from inoperable, non-metastatic HCC. The patients received a course of hepatic chemo-embolization between 1st January 2010 and 31st December 2010 at the Nantes University Hospitals, either TACE (26 patients) or TACE-DEB (24 patients). Each course received by the patient was deemed to be a new procedure. No age or sex criteria were included. The different stages of the liver disease were defined according to the Barcelona classification. Post-hospital admission consequences were not included. The doxorubicin-loaded particles used were DC-Beads™ (Terumo, Louvain, Belgium) and the (lipiodol) embolization particles used for the TACE were either resorbable (Gelatins: Gelitaspon or GeliPutty™, Gelita Medical, Estissac, France) or non-resorbable (Embogold™ calibrated particles, Merit Medical, Voisins le Bretonneux, France).

Treatments

The indication for TACE or TACE-DEB was decided in a weekly multidisciplinary meeting attended by a radiologist, a surgeon, a gastroenterologist, an oncologist and a radiotherapist. The decisions were consistent with the guidelines from the Barcelona conference [5] and the TACE and TACE-DEB procedures were carried out using standard protocols in the Departments of Radiology. In both treatment types, the angiographic techniques used involved catheterization of the hepatic artery from a femoral approach and then selective catheterization of the arterial pedicles feeding the tumors. In the case of TACE, this was followed by infusion of an emulsion containing 10 mL of Lipiodol™ (Guerbet, France) and doxorubicin (50—75 mg/m^2) followed by embolization with hemostatic gelatin fragments or microspheres, depending on angiographic findings and the operator's usual practice until flow stagnated in the 2nd and 3rd order branches of the hepatic artery. In the case of TACE-DEB, treatment involved an injection of a mixture of 4 mL of DC-Bead™ loaded with 150 mg of doxorubicin and non-ionic iodinated contrast medium.

Cost minimization study

Perspective

The perspective used was that of the hospital, counting expenditure related to the length of stay for each procedure and DRG (Diagnostic Reference Group) costs according to the ENCC (French National Scale for Common Methodology Costs) [6], readjusted for the actual length of stay in the establishment.

Measurement of costs

As the cost minimization study was retrospective, we considered the direct medical costs which were analyzed using the readjusted ENCC method [6]. Briefly, DRGs are used to estimate the costs from PMSI data (Programme to Medicalise Information Systems) and from ENCC. Average national costs are reprocessed in order to apply to the establishment in which the study is being carried out. Allocation to different expenditure lines is used to obtain two types of costs: fixed and variable. The fixed costs are clinical expenditure, logistics, and general administration and are applied on a daily basis to obtain a fixed daily cost. Variable costs do not