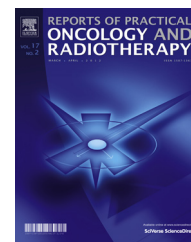


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Review

Management of liver cancer. The Surgeon's point of view

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ARTICLE INFO

Article history:

Received 8 June 2016

Received in revised form

27 December 2016

Accepted 6 February 2017

Available online xxx

Keywords:

Liver cancer

Radiotherapy

Colorectal metastasis

Hepatocellular carcinoma

Cholangiocarcinoma

ABSTRACT

During the last twenty years, a huge progress has been achieved in the treatment of liver cancer and recent strategies include interventional radiology, chemotherapy regimens and surgery. Meanwhile, Stereotactic Body Radiation Therapy (SBRT) has developed in the treatment of all organs with millimetre accuracy, very few side effects and a high control rate. So, SBRT has become a therapeutic weapon in his own right in liver tumour treatment. Many publications have reported encouraging results in colorectal liver metastasis, hepatocellular carcinoma on cirrhosis and peripheric cholangiocarcinoma. It is important that radiation therapists involve systematic multidisciplinary "liver tumour" meetings to discuss therapeutic indications and initiate treatments quickly.

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1. Background

Until now, surgery has played a central role in the treatment of liver cancer. Even though for several decades, surgical resection was the only potentially curative option, since 15 years, the therapeutic arsenal has significantly increased. Systemic and local chemotherapy, techniques of thermo ablation and, more recently, stereotactic radiotherapy, have shown encouraging results and are more and more used currently alone or in combination with surgery. At the same time, improvements in the knowledge of liver anatomy and liver function, and development of new surgical techniques allow surgeons to go further and further in terms of volume resected

or biliary and vascular reconstruction. But there are still some limits. In this way, surgery cannot be seen as the only way but as being part of a large therapeutic coordinated group including, oncologists, radiologists, gastroenterologists and radiotherapists. A multidisciplinary approach and adequate therapeutic strategies are now the keys to treat more and more patients in a curative intent.

2. Progress in surgery

The respect of some rules and recent advances in knowledge of liver capacities have enabled liver surgeons to treat more

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<http://dx.doi.org/10.1016/j.rpor.2017.02.001>

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and more patients and to improve short and long term results after hepatic resection.

2.1. Liver anatomy and liver function

Since the description of surgical liver anatomy by Couinaud 60 years ago,¹ a great number of different resection procedures have been described and achieved with very good immediate results²: non-anatomical resection, segmentectomy, bi-segmentectomy, major resection and extended major resection. However, some rules must be respected: the future live remnant (FLR) must have an adequate afferent and efferent blood supply, and biliary drainage. Furthermore, the volume of FLR must be sufficient to maintain a liver function during the postoperative period. In case of normal liver function, an FLR of approximately 25–30% is considered to be sufficient to maintain liver function after resection.³ But for patients with hepatic dysfunction (cirrhosis, severe obstructive jaundice) or earlier liver injury (chemotherapy), a higher FLR of approximately 40% is recommended.⁴ A good and simple method to estimate resectability is to estimate FLR to a body weight ratio which should be greater than 0.5.⁵ More recently, ^{99m}Tc-Mebrofenin hepatobiliary Scintigraphy has been used with success to measure FLR function.⁶

2.2. Liver regeneration

If a human or an animal can survive to a 70% ablation of the liver, this is due to the unique and remarkable capacity of regeneration. In a few weeks, the volume of FLR is restored. When liver hypertrophy is required preoperatively (portal embolization of a hemi-liver), it has been shown that the FLR increases from 10 to 46% after a period ranging from 2 to 8 weeks.⁷ But in some cases of underlying pathology (cirrhosis) or early hepatic toxicity (alcohol abuse, viral infection, chemotherapy), the capacity of liver regeneration is decreased. This must be taken into account to stop toxic agents, to plan the time of operation and the extent of the procedure.

2.3. “Secondary resectability” concept

In a significant number of cases, whatever the pathology, a liver tumour can be considered as unresectable at the time of diagnosis. The best example is given by colorectal liver metastasis. Using the multidisciplinary approach, we can stretch the limits of resectability. Thus, when the FLR is too small, we can induce hypertrophy by portal vein embolization or portal vein ligation or a combination of portal vein ligation and parenchymal transection.⁸ When the tumour volume is too important, some inductive chemotherapy regimens can induce a secondary resectability in more than half of cases.⁹ When the disease is bilobar, the concept of two-stage hepatectomy can be used.¹⁰

2.4. Technical aspects

The main risk factors of postoperative morbidity and mortality are well known: preservation of blood supply and biliary drainage, limited per-operative and postoperative blood loss and sufficient liver volume remnant. Several different

technical improvements in recent years allow us to achieve these main objectives.

2.4.1. Pre-operative liver hypertrophy

If the FLR appears to be too small after operation, it is possible to induce hypertrophy of the FLR by embolization or ligation of the portal vein of the contralateral hemi-liver.⁷ This practice is widely used and has given excellent results with low morbidity. In some situations, hypertrophy must be obtained very quickly; a recent procedure which combines portal vein ligation and parenchymal transection induces significant hypertrophy in one week. Two surgical procedures are requested but in that case morbidity and postoperative mortality are increased.⁸

2.4.2. Vascular clamping

Even if the procedure of vascular clamping is controversial, most of the surgical teams around the world use this manoeuvre. There are several different techniques from occlusion of afferent blood supply of one segment to total vascular exclusion. The most popular and widely used is the “Pringle manoeuvre”.¹¹ The effect on blood loss is significant and side effects are low.

2.4.3. Central venous pressure

Management of a low central venous pressure is of tremendous importance and limits blood loss during parenchymal transection.¹²

2.5. Hanging manoeuvre

It has been understood recently that implementing the liver transection in anatomical position for major hepatectomy is very useful, particularly in the case of big lesions. This represents the concept of anterior approach and hanging manoeuvre.¹³

2.6. Vascular and biliary reconstruction

Some very specialized teams, particularly in Asia, have published good results after vascular reconstruction of hepatic arteries, hepatic veins and microscopic biliary reconstructions.¹⁴

2.7. Raw surface management

Hemostasis and biliostasis of the liver raw surface after hepatectomy are essential. Recently, a great number of new devices such as glue, hemostatic compress, coagulation process have become available.¹⁵

3. Limits in liver surgery

In different situations, surgery cannot be applied:

Some patients, for extra hepatic reasons, are not suitable for surgery: the presence of underlying disease such as cirrhosis; planned resection would leave in place less than 30% of liver volume; planned resection would compromise afferent blood supply of the two hemi-livers or compromise afferent blood supply on one side and efferent venous drainage on the

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