Radiofrequency thermal ablation of hepatocellular carcinoma: our five year experience

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Riassunto

TERMOABLAZIONE CON RADIOFREQUENZA DELL'EPATOCARCINOMA: CINQUE ANNI DI ESPERIENZA

Sebbene la resezione chirurgica rimanga la sola terapia potenzialmente curativa per epatocarcinoma, la termoablazione con radiofrequenza percutanea intraoperatoria ha progressivamente ottenuto maggiore attenzione ed attualmente è eseguita in molti centri mondiali. Riportiamo l'esperienza di 53 pazienti con un totale di 75 noduli di epatocarcinoma trattati presso il nostro istituto tra il mese di Marzo 1998 ed il mese di Gennaio 2004. Obiettivo dello studio è di valutare la fattibilità, complicazioni, durata dell'ospedalizzazione, sopravvivenza dei pazienti sottoposti a termoablazione con radiofrequenza.
Abbiamo trattato pazienti con malattia focale (n° 41) e multifocale (n° 12); in quest'ultimo gruppo 7 pazienti presentavano lesioni unilobari mentre 5 pazienti presentavano lesioni multilobari. Il diametro medio dei noduli di epatocarcinoma era di 28.9 mm (range 15.2 – 54.3 mm). Abbiamo eseguito un totale di 107 applicazioni per ottenere la necrosi coagulativa completa dei 75 noduli di epatocarcinoma: nel gruppo sottoposto a trattamento percutaneo abbiamo eseguito una media di 1,38 applicazioni per i pazienti con malattia unifocale, mentre 2,52 applicazioni si sono rese necessarie per i gruppi di pazienti con malattia multifocale. Nel gruppo sottoposto a trattamento intraoperatorio abbiamo eseguito una media di 1,18 applicazioni per i pazienti con malattia unifocale, mentre 1,98 applicazioni si sono rese necessarie per i gruppi di pazienti con malattia multifocale. C'è stato un decesso correlato alla procedura: nel lavoro vengono inoltre descritte le complicanze maggiori e minori. Un'ecografia ed una TAC spirale sono state eseguite dopo un mese dal trattamento termoablativo associate a dosaggio ematochimico dell'á-FP: il follow-up consiste nel dosaggio dell'á-FP ematica, ecografia addominale ogni 4 mesi e TAC addominale ogni 6 mesi nel primo anno. Tutti i pazienti sono sottoposti a follow-up. Allo stato attuale 24 pazienti sono viventi con malattia, 16 pazienti sono deceduti per progressione di malattia, 7 pazienti sono deceduti per altre cause, 4 pazienti sono viventi senza evidenza di malattia. L'ospedalizzazione media è stata di 1,8 giorni per il gruppo sottoposto a trattamento percutaneo e 6,1 giorni per il gruppo sottoposto a trattamento intraoperatorio.
I nostri risultati suggeriscono che il trattamento termoablativo percutaneo ed intraoperatorio rappresenta una proce-

Introduction

Althought surgical resection remains the potentially curative therapy for selected patients with hepatocarcinoma (HCC), percutaneous and intraoperative radiofrequency thermal ablation (PRFTA and IRFTA) it's a safe and well tolerated treatment able to achieve local control of unresectable liver tumours ([1, 2]).
HCC is one of the most common solid cancer in the world: the majority of patients with disease confined to the liver may not undergo curative resection for multifocal tumours, inadequate functional hepatic reserve due to advanced cirrhosis, and dimension of the tumours that precludes a negative margin of resection (R0 resection). This condition of surgical resection risky developed a new series of minimally invasive technique for the local control of HCC in which the localized application of heat to produce coagulative necrosis, the principles of radiofrequency thermal ablation (RFTA), has begun to receive much more attention ([3, 4]). During the radiofrequency treatment the needle use creates an alternating electromagnetic field able to induce collision of water molecule with membrane proteins performing a resistive heating of core tissue: when tumour cell are heated at temperature exciding 50° C intracellular protein are denaturated and cell membranes are destroyed with dissolution of lipid bilayers ([5, 6]).
In this study we describe our experience in the multi-

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dura di facile acquisizione, ripetibile, sicura e dai tempi di esecuzione contenuti: ulteriori analisi saranno necessarie per dimostrare il reale ruolo del trattamento termoablativo con radiofrequenza in pazienti selezionati affetti da epatocarcinoma.
Parole chiave: Termoablazione, epatocarcinoma, procedura mininvasiva.

Abstract

Purpouse: *We describe our experience in the multimodal treatment of HCC patients both using the PRFTA and IRFTA treatment associated or not with hepatic resection, valuating the feasibility, the complication, length of hospital stay and survival rate of selected HCC patients.*
Materials and Methods: Between March 1998 and January 2004, 53 HCC patients undergoing PRFTA and IRFTA treatment. We describe 41 patients with monofocal disease and 12 patients with multifocal disease: in this last group 7 patients had unilobar involvement while 5 patients had multilobar tumour.
Results: *We reported patients underwent RFTA because not candidates to surgical procedures and patients underwent liver resection and open radiofrequency treatment associated. We successfully used percutaneous and intraoperative approach being the last one significantly advantageous in lesions greater than 5 cm, multiple bilobar tumours and tumours close to the hilum and major vessels: the laparotomic approach permitted the temporary occlusion of the vascular inflow allowing Pringle manoeuvre.*
Discussion: *Hepatocarcinoma still represent one of the major causes of cancer related death worldwide. Systemic therapeutic agents and locoregional agents are rarely correlated to complete response and usually associated to high toxicities: the potentially curative or palliative benefit of RFTA in non surgical candidates improve overall patients survival significally better then the chemotherapy regimens.*
Conclusion: *RFTA appears to have several advantages, which also include a reducing in morbidity, a shortening of the hospital stay and good response to patients requirement in term of enduring pain.*
Key words: Radiofrequency (RF) ablation, Hepatocellular carcinoma (HCC), Minimally invasive procedure.

modal treatment of HCC patients both using the PRFTA and IRFTA treatment associated or not with hepatic resection, valuating the feasibility, the complication, length of hospital stay and survival rate of selected HCC patients.

Materials and methods

We performed a retrospective evaluation between March 1998 and March 2004 of 53 HCC patients undergoing PRFTA and IRFTA treatment. We describe 41 patients with monofocal disease and 12 patients with multifocal disease: in this last group 7 patients had unilobar involvement while 5 patients had multilobar tumour. The mean diameter of HCC nodule was 28.9 mm ranging from 15.2 to 54.3 mm. Ours selection criteria excluding patients from hepatic curative resection includes high surgical risk procedure, refused surgery or recurrence after surgery, absence of portal vein thrombosis and or extrahepatic spread, protrombin activity more than 50%, platelet count more than 50000 mm3: proximity to major vessels or bile ducts was not considered a controindication to the RFTA treatment and so the dimension and number of the HCC nodule treating tumour multiple and even more than 5 cm in diameter. All patients were cirrhotic: 31 Child A, 18 Child B and 4 Child C. The patients underwent history and physical examination: laboratory test consist in complete blood count, hemocoagulative profile, a renal and hepatic panel including serum dosage of alpha-fetoprotein (áFP), chest radiograph, computed tomography (CT) scanning, ultrasound (US) examination and in some case magnetic resonance imaging (MRI). Following the RFTA procedure we obtained the same biochemical panel in the first postoperative day, and then at 1 month with dosage of áFP and CT examination. We performed 44 percutaneous procedures while 9 patients were treated during an open operative procedure. Ablation was performed using a 100W – 500 KHz source of radiofrequency (CC1 Cosman Coagulator System Radionics®, Burlington Massachu-setts) completed by a cooling pump with 0°C saline solution able to cooling the lumen of the RF electrodes: needle use were represented by an internally cooled electrode with 3 cm exposed tip (Cool – Tip RF Radionics®), and a cluster electrode (Cluster RF Radionics®) used during the open surgical procedures. Electrodes were inserted into the tumour under ultrasound guidance using a 3.5 Mhz convex probe. The duration of a single procedure of RFTA was 12 minutes in median with a range of 8 to 18 minutes depending on the size of the HCC nodule. We performed an intraoperative US monitoring of the procedure and a US examination at the end of thermal ablation considering a satisfactory US pattern an hiperechoic image, due to gas bubble, greater then the previous image of the HCC nodule: we retreat the lesion if this finding doesn't appear, otherwise withdrawn the needle.
The immediate therapeutic efficacy assessment was evaluated with a dynamic CT performed within 1 month after RFTA treatment completed by simultaneous dosage of áFP: we consider CT scan negative if a complete nonhenancing area with diameter equal to or larger than treated HCC nodule was seen in the site of tumour. Current follow up is based on dosage of serum tumour markers and CT examination every 4 months for the first year.

Results

During the study period 53 patients underwent RFTA for HCC. No patients were found to have extrahepatic disease: three patients with extrahepatic disease at laparotomy were excluded from the study. The group of patients were heterogeneous in term of tumour localization: 41 patients had monofocal disease while 12 patients had multifocal disease. Seven patients of the multifocal group had unilobar involvement and 5 patients had multilobar involvement. Median age at time of RF procedure was 62.2 years with 32 men and 21 women treated. No patients underwent neoadjuvant therapy before the RFTA treatment. All patients underwent CT scanning with intravenous contrast and percutaneous ultrasound before thermal ablation: the mean diameter of HCC lesions treated was 28.9 mm (range 15.2 - 54.3). All patients had a cirrhotic liver: clinical evidence of hepatic dysfunction was classified according the Child-Pugg criteria: 31 patients were Child A, 18 patients were Child B and 4 patients Child C. No patients were enrolled in the orthotopic liver transplantation (OLT) program excluding from transplantation criteria.

Ours patients were enrolled in the study fulfilling the following condition: high surgical risk, recurrence after surgery, refused surgery, severe impairment of the coagulating test with prothrombin activity more than 50%, platelet count more than 50000 mm**3**. The exclusion criteria were tumour size larger than 6 cm, a complete portal thrombosis: extrahepatic disease, multiple nodules, severe liver disease and proximity to major vessels or bile ducts were not excluding criteria from treatment. We perform a total of 107 passes to achieve the complete coagulative necrosis of 75 HCC nodules. In the PRFTA group we performed a mean number of 1.38 passes for patients with monofocal disease, while a mean number of 2.52 passes were needed for patients with multifocal disease. A median number of 1.18 passes was necessary to achieve complete necrosis in the IRFA group for patient with monofocal disease while a mean number of 1.98 passes was necessary for patients with multifocal disease.

Complications occurred during intraoperative and percutaneous RF procedures are presented in Table I: the complication rate was similar comparing percutaneous and intraoperative group treatment. A slight increase of serum level of bilirubin, leucocytes and creatin phosfokinase were observed in the first three days after treatment returning to baseline in the following seven days. Fever probably due to absorption of necrotic tissue occurred in 18/53 patients and resolved spontaneously. A US intraoperative evaluation was performed in the group treated during open procedure: the size and location of HCC lesions were recorded and compared with preoperative data imaging. The newly identification of 3 lesions in IRFTA patients required a change in the operative procedure. The preoperative US study in the group treated by percutaneous approach didn't identify additional lesions and so there were not change in the preoperative indications. IRFTA was combined with liver resection in a total of 9 patients. Four patients required a second treatment and 2 patients required a third treatment. We repeat 3 procedures for progressive liver disease outside the initial RF site, and 3 procedures to complete the coagulative necrosis of the major liver nodules. The interval between the first RFTA treatment and the other ones overage 3.2 ± 4.2 months. CT scan, complete blood count, liver function and áFP dosage was obtained at 1 month: scans and blood test were obtained every four months for 1 year, every 6 months for three years and every year thereafter. Two patients were lost to follow-up. At a median follow-up of 39 months 8/51 (15.7%) patients developed recurrences in the site of the previous treatment while 12/51 (23.5%) patients outside the initial RF site. Recurrences in the site of the initial RF treatment were related to the dimension of HCC nodules, following treatment of larger lesions and of tumours with vascular invasion. Of those patients who have recurred in the site of the previous treatment only

Tab. I – COMPLICATION WITH PRFTA AND IRFTA TREATMENT

Mortality	1 (1.9%)
Major Complication	
• Bile Leak	1 (1.9%)
• Porthal Thrombosis	1 (1.9%)
• Hepatic Abscess	2 (3.8%)
• Worsening Liver Disfunction	3 (5.8%)
Minor Complication	
• Mild Postoperative Pain	15 (29.4%)
• Pad Skin Burn	1 (1.9%)
• Pleural Effusion	8 (15.6%)
• Fever	18 (35.2%)

Tab. II – RECURRENCES AND CURRENT STATUS AT MEDIAN FOLLOW UP OF 39 MONTHS

	PRFTA	*IRFTA*
RSPT	4 (7.8%)	4 (7.8%)
RNSPT	8 (15.6%)	4 (7.8%)
AWD	17 (33.3%)	7 (13.1%)
NED	3 (5.8%)	1 (1.9%)
Death	10 (19.6%)	13 (25.4%)

Abbreviations
RSPT: Recurrence in Site of Previous Treatment;
RNSPT: Recurrence Not in Site of Previous Treatment;
NED: Not Evidence of Disease;
AWD: Alive With Disease.

4/8 (50%) patients are alive with not clinical evidence of disease while 5/12 (41.6%) patients who have not recurred in the site of the initial treatment are alive with not clinical evidence of disease. Tumour marker levels decreased after IRFTA and PRFTA in 27/51 (52.9%) patients; the level did not decreased in those patients who had early postoperative recurrences. Tumour size, vascular invasion and high grade of liver dysfunction were found to have a correlation with early postreatment recurrences. At the time of follow-up 24/51 (47,1%) patients are alive with disease, 4/51 (7.8%) patients had not evidence of disease, 16/51 (31.4%) patients died for the progression of the disease while 7 patients died for other causes not related to the liver disease. Recurrences and current status at median follow up of 39 months are reported in table 2. We didn't observe correlation between the rates of new intrahepatic HCC nodules and the approach utilized.
Median hospital stay was 1.8 days for patients undergoing percutaneous procedure and 6.1 days for patients undergoing intraoperative procedure.
Survival rates for the first year was 82.2% in the PRFTA group while was 72,2% for the IRFA group, 68.8 and 62.3% respectively for the second and the third year, 48.1% and 42.2% for the fourth and fifth year.

Discussion

Hepatocarcinoma still represent one of the major causes of cancer related death worldwide. Systemic therapeutic agents and locoregional agents are rarely correlated to complete response and usually associated to high toxicities: the potentially curative or palliative benefit of RFTA in non surgical candidates improve overall patients survival significally better then the chemotherapy regimens ([7]).
RFTA appears to have several advantages, which also include a reducing in morbidity, a shortening of the hospital stay and good response to patients requirement in term of enduring pain ([8]). Since the 1990's literature report series and results about treatment of hepatic solid tumours by RFTA: radiofrequency elettrocautery devices have been used in the recently past years to perform haemostasis during surgical procedures ([9]). New monopolar and bipolar technology devices recently were used to obtain tissue necrosis of large areas of hepatic parenchyma particularly in malignant solid tumours. Radiofrequency power, impedance and current delivered by the radiofrequency generator permit to destroy large areas of tissue maintaining a temperature between 60 and 110° C for a fixed term of minutes. At the time of this study there are at least 14 series published in the literature in which the results of RFTA has been presented: however these results remains preliminary because long term follow up is still not available ([10, 11]).
Curley, Solbiati and Biilchlic reported in large clinical study favourable results, which encouraged and still encouraging surgeons and radiologist on the safety and clinical efficacy of RFTA in spite of the poor information about risks and optimal approaches ([12, 13, 14]). In this study we do not considerate the thermal ablation as an alternative to liver resection which we still advocate as the primary curative procedure: ours multimodal therapeutic assessment program provide the liver resection whenever is possible.
We reported patients underwent RFTA because not candidates to surgical procedures and patients underwent liver resection and open radiofrequency treatment associated. We successfully used percutaneous and intraoperative approach being the last one significantly advantageous in lesions greater than 5 cm, multiple bilobar tumours and tumours close to the hilum and major vessels.
The laparotomic approach permitted the temporary occlusion of the vascular inflow allowing Pringle manoeuvre: in ours experience treatment of large or multiple lesions, improved by temporary occlusion of hepatic blood inflow, still remain time consuming notwithstanding the new generation of power generator and radiofrequency probe ([15, 16, 17]). Patients eligible for laparotomic radiofrequency procedure were previously excluded from hepatic resection following this condition: number, bilobar location of tumour and proximity to major vascular and bile duct structure precluding R0 resection, hepatic reserve inadequate for major hepatic resection. Notwithstanding this indication some patients underwent resection of the disease in one lobe and RFTA in the remaining lobe ([18]).
We performed RFTA under real time US guidance with a guide device incorporated into the US probe. We used two types of 20 cm long – 18 gauges – cooled radiofrequency electrode depending on the size of the tumours and on the approach used. A single electrode for the PRFTA procedure and the same or a cluster electrode for the IRFTA ones: the radiofrequency electrodes were connected to a 500 KHz radiofrequency generator. During the application the appearance and progression of hyperecoic area around the tip of the electrode help us to guide the duration of thermal application: further application are required in those area where hyperecogenicity is not evident. Each application lasts for 8 – 14 minutes both in PRFTA and IRFTA group.
Our patients at a median follow – up of 39 months (range 13-52 months) had local recurrence in the previous site of treatment in 8/51 cases and recurrence not at RF site in 12/51 cases ([19]).
The majority of recurrence were observed in the group of patients underwent RF treatment of large nodules more than 4 cm in diameter. Recurrence in other site different from the first RF site were not related with diameter of the lesions previously treated and/or hepatic resection performed and/or different approach used ([20, 21]).

Curley reports a large study in which 123 patients underwent radiofrequency treatment for 123 hepatic tumours. The local rate recurrences was 1,8% at a median follow-up of 15 months with minimal complication and no related death. The surgical recurrence rate was higher in patients with largest nodule and occurred in tumours greater than 6 cm in diameter: dimensions did not correlate with recurrences in different site than previous radio-frequency treatment ([22, 23]).

At a median follow up of 39 months of those patient who recurred in the RFTA previous site of treatment 3 patients are alive with not clinical evidence of disease after repeated RFTA treatment, 2 are alive with disease and 3 are died for progressive disease: of those patient who have not recurred in the RFTA previous site of treatment 1 patient are alive with not clinical evidence of disease after repeated RFTA treatment, 8 are alive with disease and 3 are died for progressive disease.

In ours study we obtained complete necrosis in 55 lesions while 20 lesions required a new treatment to obtain curative necrosis.

The curative necrosis obtained for the positive "oven effect" in nodular HCC measuring up than 4 centimetres was not guaranteed in case of multinodular HCC because the interposed septh of fibrotic cirrhotic tissue preventing heat diffusion: this hapatocarcinomatous surrounding area still remains even if more passes and insertion were done ([24, 25]).

Tumour dimensions were predictive of number of treatment. Nodular HCC measuring up than 4 cm in diameter need more passes and insertion in the same session or in different sessions. Wood in 231 ablation of unresectable hepatic tumours believed that the maximum diameter of tumour treated by RFTA is closely associated with the specific probe utilized. Also depends on the delineation of the margins of treatment ablation according to US examination especially when multiple lesions overlap ([26]). The only death related to the procedure was a result of a progressive hepatic insufficiency post radiofrequency treatment: this fatal complication due to hepatic failure was a result of more extensive tumour involvement not appreciated on preoperative CT. Tumour close to major biliary duct, hepatic major vessels and gallbladder were treated without fatal complication ([27, 28]).

One patient presented a porthal thrombosis: the radiofrequency induced porthal damage was related to the localization of a 3.5 cm HCC nodule closely to the main porthal bifurcation. Two patients suffered of perihepatic abscess only in the concomitant hepatic resection groups. Two patients developed hepatic abscess successfully treated by ultrasound percutaneous drainage and short course of antibiotic drugs: these two patients developed a right pleural effusion which not required percutaneous aspiration but resolved with medical therapy.

No episode of heat injuries to adjacent organs, renal and cardiac failure or other upper gastrointestinal complications occurred. A bile duct injury occurred in one patient: no strictures related to the treatment of tumours close to the confluences of hepatic ducts were observed. RFTA has been well tolerated with few minor complication: some patients experienced mild postoperative pain which required not-steroidal drugs especially in the intraoperative group treatment, pleural effusion, abdominal pain and fever. No patients required blood transfusion: blood products were required preoperatively to correct coagulopathy with patient with advanced hepatic insufficiency. A slight increase of serum level function tests were observed and returned to baseline value 3 days postreatment: leucocytosis and bilirubine levels increase transiently and returned to normal value in 3 weeks post treatment. We performed 1 months post treatment a CT scan, a blood count dosage of áFP and complete liver function. The CT scan was considered negative if no contrast enhancement was observed after the venous infusion of blood contrast ([29, 30, 31]). The result of liver blood function test and áFP dosage was compared to the results observed before RFTA treatment showing a decrease level of tumour marker and a satisfactory liver function 1 months post treatment. In all patients the following serum test were checked before treatment and 24 hours, 48 hours, 3 days and 1 month after treatment: transaminase, bilirubin, alkaline phosphates, creatinine, haemoglobin, fibrinogen, complete coagulation activity and blood cell count. All patient were follow up: at this time 25 patients are alive with disease, 17 patients died for progression of the disease while 7 patients died for other causes and 4 patients are alive with disease. The mean hospital stay was 1.8 days for PRFTA treated patients and 6.1 days for IRFTA patients. We found RFTA to be a efficacious in ablating unresectable HCC lesions with a low recurrence rate, low cost: it remains well tolerated with short hospital stay still reducing the risk of seeding and bleeding especially in the PRFTA group treatment. We confirm the feasibility, the low incidence of side effects even if associated to hepatic resection. For ours knowledge still remains the treatment of choice in selected HCC patients ([32]).

Conclusions

RF treatment is a minimally invasive procedure safe effective and repeatable: it can be applied via operative approaches or percutaneously for the local control of HCC lesions. Laparotomic approach allows a better control of intrahepatic disease not previously diagnosed via US evaluation and recognition of new lesions. It allows also hepatic mobilization in order to avoid adjacent organ lesions and results in optimal management of larger lesions. The percutaneous approach is reserved to patients who are not candidate to surgical procedure and patients with high recurrence rate and progression disease. Predictors of recurrence in the previous radiofrequency

site of treatment remains large ablation volume while number of tumours treated are not correlated with recurrences.
Major complications and death after RFTA treatment still remains rare respecting carefully selection criteria and different approaches. Further progress in RFTA generator, probe and needle electrode, the newly laparoscopic approach for RFTA treatment and resection, will help surgeons in prolong survival of patients not candidates to surgical procedures for HCC lesions ([33, 34]).

Summary

Althought surgical resection remains the potentially curative therapy for hepatocellular carcinoma (HCC), percutaneous and intraoperative radiofrequency thermal ablation (PRFTA and IRFTA) has began to receive more attention and has become widely performed. We report the experience of 53 patients with a total of 75 HCC nodules, treated in our Institute between March 1998 and January 2004: aim of this study was to evaluate feasibility, complications, length of hospital stay and survival rate of patients undergoing thermal ablation. We treated patient with both focal (41 patients) and multifocal (12 patients) disease: in this last group 7 patients had unilobar lesions while 5 patients had multilobar lesions. Mean diameter of HCC nodules was 28.9 mm ranging from 15.2 to 54.3 mm. Total number of passes to achieve complete necrosis of the 75 HCC nodules was 107: in the percutaneous treatment group we performed a mean of 1.38 passes for unifocal disease patient while 2.52 passes were necessary for multifocal disease group. In the intraoperative treatment group the mean number of passes to achieve necrosis was 1.18 for unifocal disease patient while was 1.98 for multifocal disease group. There were one death related to the procedure: the major and minor complication are also described. Sonography and dynamic CT was performed within 1 month after RF treatment with simoultaneous dosage of AFP: follow up study consisted in AFP dosage, US examination every 4 months and CT examination every 6 months in the 1st year. All patient were follow up: at this time 24 patients are alive with disease, 16 patients died for progression of the disease, 7 patients died for other causes while 4 patients had not evidence of disease. The mean hospital stay was 1.8 days for PRFTA treated patients and 6.1 days for IRFTA patients. Authors results suggest that both PRFTA and IRFTA is an easely repeteable, effective, safe and time-saving technique: further investigation will be required to demonstrate the real role in the treatment of selected HCC patients.

Conclusions

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Major complications and death after RFTA treatment still remains rare respecting carefully selection criteria and different approaches. Further progress in RFTA generator, probe and needle electrode, the newly laparoscopic approach for RFTA treatment and resection, will help surgeons in prolong survival of patients not candidates to open surgical procedures for HCC lesions ([33, 34]).

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Commento Commentary

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Il carcinoma epatocellulare (HCC) rappresenta il quinto tumore maligno per frequenza in tutto il mondo, con un incidenza annuale in continuo incremento sia nei paesi sviluppati che in quelli in via di sviluppo. Le uniche opzioni terapeutiche potenzialmente curative sono il trapianto di fegato o la resezione chirurgica, ma sfortunatamente solo il 20-30%

dei pazienti nelle varie casistiche candidabile a tali procedure o per lo stadio avanzato della malattia o per la mancanza di un numero adeguato di organi da trapiantare. Per questo motivo si sono, sviluppate in questi ultimi anni numerose metodiche miniinvasive per il trattamento locoregionale, del carcinoma epatocellulare che consentono non solo un approccio terapeutico efficace e ripetibile nel tempo, ma che presentano anche una minor morbidità associata. Fra le diverse metodiche miniinvasive, utilizzate nei pazienti con HCC di dimensioni fino ai 3-5 cm di diametro, non suscettibili di trattamento chirurgico, la Termoablazione con Radiofrequenza produce i migliori risultati sia, in termini di distruzione della, massa tumorale, con un minor tasso di recidive locali, sia in termini di sopravvivenza a lungo termine. Numerosi sono i contributi in letteratura sull'argomento ed il lavoro presentato dagli Autori, pur non apportando nessuna novità significativa riguardo alla metodica ed alla sua efficacia, offre una discreta casistica di 53 pazienti con HCC trattati mediante RF tra il 1998 ed il 2004. Gli Autori descrivono la loro esperienza che è, nei risultati, sovrapponibile a quella già descritta da molti altri gruppi. Sarebbe stato forse interessante se gli Autori avessero messo a confronto la termoablazione con radiofrequenza con le altre metodiche disponibili, cosi come raccomandato, durante, la Conferenza dell'"European Association for the Study of the Liver" tenutasi a Barcellona nel Settembre 2000.

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Hepatocellular carcinoma (HCC) is the fifth most frequent malignancy worldwide with an increasing annual incidence in both developing and developed countries. The potentially curative treatments are liver transplantation or surgical resection, but, unfortunately, only 20 to 30% of patients, in different series, is eligible to such procedures because of the advanced stage of the disease or because of the lack of transplantable organs. Hence several minimally invasive strategies permitting an effective and repeatable treatment with lower morbidity developed in these last years for the local treatment of HCC. Among the different minimally invasive procedures performed in patients not candidates for surgery with HCC up to 3-5 cm large, Radiofrequency Thermal Ablation offers the best results in destroying the neoplastic mass, with lower rate of recurrence, and in longterm survival. In literature several papers are available in this field and the scientific article presented by the Authors, although it does not reveal any significant novel information to the procedure and its efficacy, describes a fairly good series of 53 HCC patients treated by RF between 1998 and 2004. The Authors present their experience which is similar in results to those described by other groups. Perhaps it would have been interesting if the Authors had correlated Radiofrequency Thermal Ablation to different procedures available, as recommended during the Conference of the "European Association for the Study of the Liver" which took place in Barcelona on September 2000.

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