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Anesthetic management in hepatectomy of a cirrhotic patient with hepatocellular carcinoma: a case report

Manejo anestésico en la hepatectomía de un paciente cirrótico con carcinoma hepatocelular: un reporte de caso

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ABSTRACT. Introduction: surgical resection in hepatocellular carcinoma (HCC) remains one of the most effective curative methods; however, the complexity of perioperative management is controversial in relation to current guidelines. **Objective:** to describe the anesthetic and perioperative approaches used in a patient with cirrhosis undergoing radical hepatectomy for HCC, emphasizing the relevant determinants of surgical outcomes. **Case presentation:** an 82-year-old man diagnosed with hepatocellular carcinoma in the right lobe due to alcoholic cirrhosis (Child-Pugh A). He underwent radical right hepatectomy after preoperative portal embolization. Total intravenous anesthesia with controlled infusion was used. Continuous central venous pressure control was maintained by fluid restriction combined with vasopressor infusion. Postoperative care included liver protection measures and complication management. The patient was subsequently discharged with outpatient follow-up. **Conclusion:** the surgical risks in this case were considerable, but the outcome was positive thanks to adequate preoperative and perioperative management. Further research is needed to investigate how these factors influence the surgical outcome of certain difficult-to-manage pathologies.

RESUMEN. Introducción: *la resección quirúrgica en el carcinoma hepatocelular (CHC) sigue siendo uno de los métodos curativos más eficaces; sin embargo, la complejidad del manejo perioperatorio es controversial referente a las guías actuales.* ***Objetivo:*** *describir los enfoques anestésicos y perioperatorios utilizados en un paciente con cirrosis sometido a hepatectomía radical por CHC, haciendo hincapié en los determinantes relevantes de los resultados quirúrgicos.* ***Presentación del caso:*** *hombre de 82 años diagnosticado con carcinoma hepatocelular en el lóbulo derecho por cirrosis alcohólica (Child-Pugh A). Se sometió a una hepatectomía radical derecha tras una embolización portal preoperatoria. Se utilizó anestesia total intravenosa con infusión controlada. Se mantuvo un control continuo de la presión venosa central mediante la restricción de líquidos combinada con la infusión de vasopresores. Los cuidados postoperatorios incluyeron medidas de protección hepática y manejo de complicaciones. Posteriormente, el paciente fue dado de alta con seguimiento ambulatorio.* ***Conclusión:*** *los riesgos quirúrgicos en este caso fueron considerables, pero el resultado fue positivo gracias a un manejo preoperatorio y perioperatorio adecuado. Es necesario investigar como estos factores influyen en el resultado quirúrgico de ciertas patologías de difícil manejo.*

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Abbreviations:

CVP = Central Venous Pressure
HCC = Hepatocellular Carcinoma
ICU = Intensive Care Unit
MAP = Mean Arterial Pressure
MRI = Magnetic Resonance Imaging
TIVA = Total Intravenous Anaesthesia

INTRODUCTION

Liver cancer is the third leading cause of oncologic mortality worldwide[1,2]. Hepatocellular Carcinoma (HCC) is the most common form. According to GLOBOCAN in

2022 approximately 866,000 new cases and 759,000 deaths were reported worldwide[3]. New estimates indicate that the prevalence of HCC is steadily increasing, especially in population strata with a high burden of chronic liver disease[1-3].

For patients with localized disease and preserved hepatic function, surgery is the preferred treatment due to its ability to resolve the condition[4]. This intervention is considered a major abdominal surgery, so the choice of patients, perioperative control and postoperative complications must be careful to reduce morbimortality and recurrence[5].

The way a patient is managed in the perioperative period has a great impact on the effectiveness of the surgery and the likelihood of postoperative complications. During and after the surgical process, the anesthesiologist has the ability to influence hemodynamic stability, metabolic control and liver function[6].

A selected method of anesthesia and a corresponding hemodynamic strategy should ensure the procedure optimally[6]. This report focuses on describing the anesthesia and perioperative management of a patient with a diagnosis of HCC and cirrhosis who underwent right radical hepatectomy. This case highlights proper planning from patient selection to postoperative complication management.

CASE PRESENTATION

The patient is an 82-year-old male with a history of chronic alcohol consumption for more than 30 years, evolving to Child-Pugh A cirrhosis two years ago, obesity, arterial hypertension and prostatectomy for cancer, without frailty criteria; HCC was diagnosed in the right lobe, LI-RADS 5 by Magnetic Resonance Imaging (MRI) in 2024 *(Figure 1)*. The patient underwent chemoembolization under general anesthesia where it is not completed due to weakness and vasospasm of the tumor arteries. After a medical board, right radical hepatectomy is proposed as definitive treatment following portal embolization.

As a pre-surgical radio-interventional procedure, portal embolization of the right lobe is performed to stimulate compensatory hypertrophy of the remaining lobe. Approximately one month later, computed tomography volumetry confirms the enlargement of the remaining lobe *(Figure 2)*. Before admission to surgery, he is classified as high surgical risk, Goldman III and ASA III. Prophylactic cefazolin 2 g was administered, and laboratory tests were performed prior to the procedure *(Table 1)*.

Levobupivacaine 8 mg and morphine 150 µg were administered intrathecally and started with Total Intravenous Anaesthesia (TIVA). Intravenous induction started with an initial dose of propofol 2.5 µg/ml up to 4 µg/mL and remifentanil 2.0-3.5 ng/ml, rocuronium bromide 40 mg was used as muscle relaxant and 15 mg every 40 minutes as maintenance dose. After induction, the airway is secured with endotracheal tube #8 with videolaryngoscope, maintaining a tidal volume of 4 to 6 mL/kg and a PEEP < 5 cm H_2O. Arterial line is cannulated for invasive Mean Arterial Pressure (MAP) monitoring,

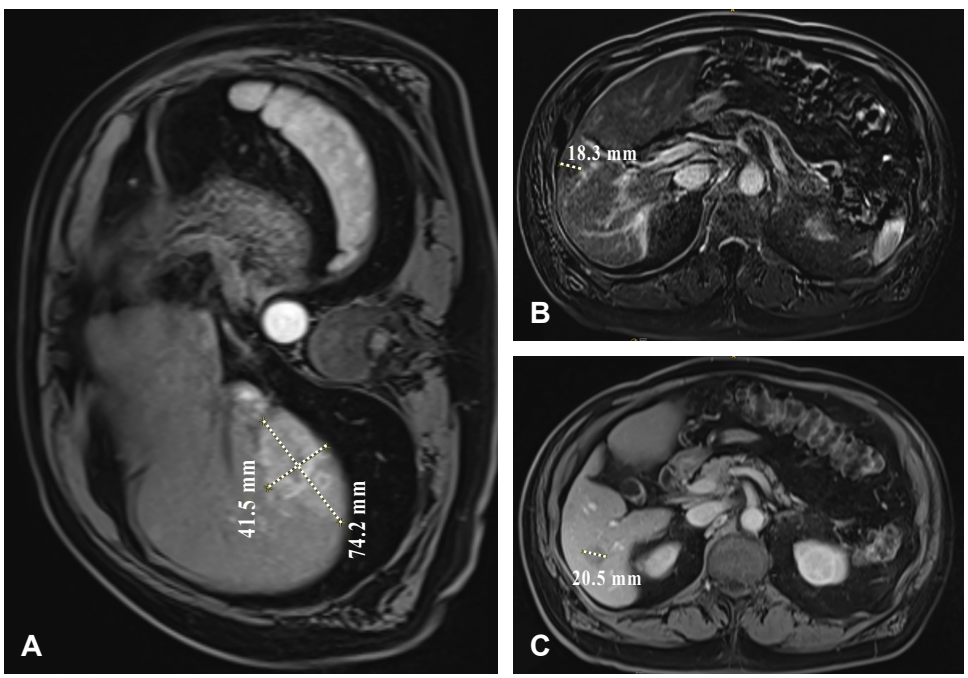

Figure 1:

Preoperative hepatocellular carcinoma magnetic resonance imaging in right lobe. **A)** Focal lesion located in segment VII and measures 74.2 mm. It presents with contrast hyperenhancement in the arterial phase and contacts the left suprahepatic vein. **B)** Lesion located in segment V, measuring 1.8 cm, with marked contrast washout. **C)** Lesion located in the VI segment, measuring 2 cm, with contrast hyperenhancement in arterial phase.

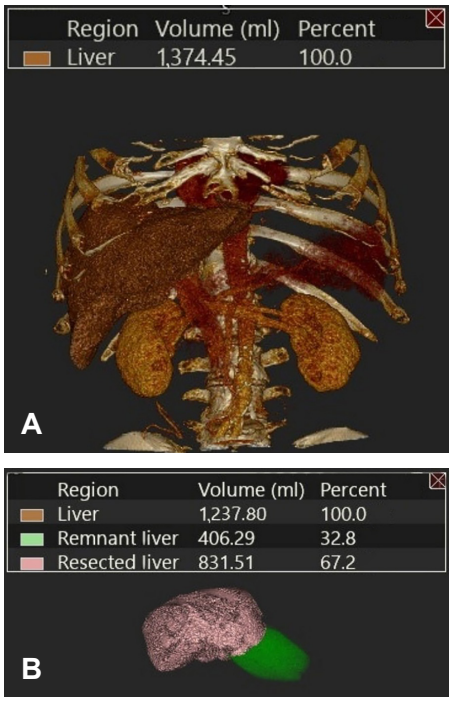

Figure 2:

CT liver volumetry shows the entire liver volume after portal embolization and remnant liver demonstrating compensatory hypertrophy of the remaining liver lobe with 32.8%.

internal jugular vein is catheterized to measure Central Venous Pressure (CVP) and glucose is continuously monitored. A bispectral index of 40-60 was maintained for hypnotic depth monitoring, finally a thermal blanket was covered. CVP was decreased with water restriction, vasodilatation due to spinal anesthesia and good TIVA depth. Surgery was started with norepinephrine 0.02 µg/kg/min IV with maximum dose of 0.07 µg/kg/min to maintain MAP > 60 mmHg. During the operation, the Pringle maneuver or other vascular occlusion maneuvers were not necessary; the surgical specimen was removed without any complications *(Figure 3)*. Finally, resuscitation was performed with Ringer Lactate 1,000 mL, polygeline 300 mL and plateletpheresis 220 mL; urinary flow was > 0.5 mL/kg/h with a total of 300 mL; final bleeding of 700 mL and surgical duration of 2:30 hours. He was intubated and transferred to the Intensive Care Unit (ICU) for postoperative control with stable vital signs.

During ICU management, he presented hepatic dysfunction *(Table 1)* and bleeding from drainage, managed with fresh plasma, cryoprecipitates and medical management, which improved, and he was transferred to the floor. However, after the transfer, he developed hepatic encephalopathy and ascites, which were managed with lactulose, rifaximin, albumin and diuretics, presenting improvement and resolution of complications; finally, he was discharged after 12 days with outpatient management.

DISCUSSION

According to Western guidelines, such as those of EASL (European Association for the Study of the Liver) and the AASLD (American Association for the Study of Liver Disease), liver resection in HCC is limited to patients with solitary tumors, without macrovascular invasion and with good liver function, excluding those with significant portal hypertension. The Japanese Societies of Gastroenterology and Hepatology, however, have a more pragmatic approach, allowing surgery in patients with mild portal hypertension and multiple satellite nodules, provided there is sufficient hepatic

Table 1: Preoperative, postoperative and normal values laboratory parameters of the case.

Parameters	Preoperative	Postoperative	Normal value
Complete blood count			
Hemoglobin (g/dL)	14.1	10.0	14-17.5
Leukocytes (cel/mm^3)	4,190	15,210	4.0-11.3
Coagulation tests			
Platelet count (cel/mm^3)	95,000	140,000	150,000-450,000
PT (seconds)	11.3	13.9	10-14
INR	1.0	1.24	0.8-1.2
Fibrinogen (mg/dL)	291	205	200-400
Metabolic test			
Basal glucose (mg/dL)	98	137	74-100
Renal function			
Serum creatinine (mg/dL)	0.83	1.05	0.7-1.2
Urea (mg/dL)	28	34	17-49
Liver function			
TB (mg/dL)	0.54	1.07	0-1.2
DB (mg/dL)	0.32	1.69	0-0.3
IB (mg/dL)	0.22	0.38	0-0.7
AST (U/L)	39	231	0-50
ALT (U/L)	43	228	0-50
Albumin (g/dL)	3.6	2.9	3.5-5.2
Arterial blood gas analysis			
pH	7.4	7.31	7.35-7.45
pCO_2 (mmHg)	37.7	36.3	35-45
pO_2 (mmHg)	186.6	93.0	80-97
HCO_3 (mmol/L)	22.9	18.0	22-26
BE (mmol/L)	−1.9	−8.2	0-1
SpO_2 (%)	99.6	97.0	95-100
Blood lactate (mmol/L)	1.7	4.6	0.5-2.2

ALT = alanine transaminase. AST = aspartate aminotransferase. BE = base excess. DB = direct bilirubin. HCO_3 = bicarbonate. IB = indirect bilirubin. INR = International Normalized Ratio. pCO_2 = partial pressure of carbon dioxide. pH = potential of hydrogen. pO_2 = partial pressure of oxygen. PT = Prothrombin time. $SatO_2$ = oxygen saturation. TB = total bilirubin.

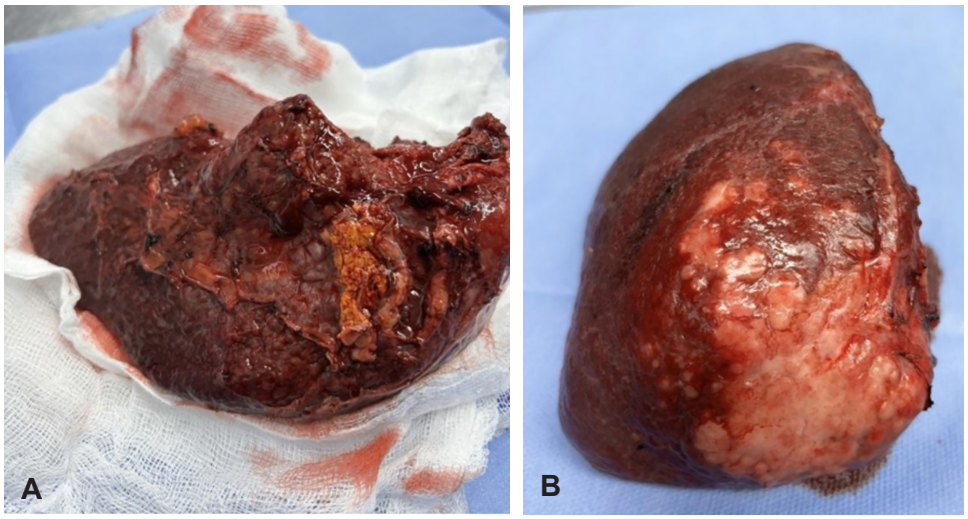

Figure 3:

A) Surgical specimen of the resected right liver lobe post-hepatectomy measuring 170 × 90 × 64 mm with margins free of neoplasia. **B)** A tumor area measuring 70 × 60 × 27 mm, whitish brown color with irregular edges, is identified 20 mm from the nearest surgical margin.

functional reserve. In the case analyzed, the application of the Japanese consensus was justified, since it allows a better refinement of surgical candidates and, therefore, optimizes the chances of curing patients who would otherwise be considered inoperable for resection under the criteria of the other guidelines[4].

In patients with HCC and cirrhosis, anesthetic and perioperative control represents a challenge in hemodynamic management. Evidence has been suggested that propofol could inhibit proliferation, metastasis and induce apoptosis of malignant tumors, which theoretically could influence oncologic prognosis[7]. However, although some studies have pointed to these effects, the evidence is still limited and their actual impact on tumor survival and progression remains an area of ongoing research. It has also been proposed that local anesthetics may play a role in tumor cell killing and reduction of tumor suppressor gene methylation, although more research is required to confirm these mechanisms[8]. Considering these findings, propofol and remifentanil were used in surgery, not only because of their potential benefit on tumor biology, but mainly because of their favorable pharmacokinetic profile in patients with cirrhosis, as they are metabolized outside the liver and offer improved hemodynamic stability[7,9,10]. In addition, the use of spinal anesthesia with levobupivacaine and morphine provided effective analgesia, decreasing the requirement for intravenous opioids[11-13].

Blockade of the transverse plane of the abdomen with local anesthetic as an adjunct to standard analgesia improves pain control and reduces opioid use[14]. However, it was not used in this case.

From the hemodynamic point of view, hydric restriction and the use of noradrenaline allowed preservation of CVP < 5 cm H_2O, which reduced hepatic congestion, massive bleeding and the risk of subsequent hepatic failure. Recently, improvements in the management of cirrhotic patients have demonstrated this strategy, which minimizes volume overload and optimizes hepatic perfusion[15].

Fluid replacement was performed with ringer lactate and polygeline to avoid blood transfusion, since this worsens the prognosis in this type of surgery, since it is associated with immunosuppressive effects; and the patient also had an adequate hemoglobin *(Table 1)*[16]. A systematic review concluded that the best approach was balanced crystalloids (e.g., lactated Ringer's) as a maintenance fluid and colloids as a volume expander (e.g., human albumin and polygeline)[17].

To avoid hypothermia that aggravates coagulopathy and hepatic dysfunction, a thermal blanket was used to maintain body temperature > 36 ºC. Similarly, greater emphasis was placed on glucose control, since a higher incidence of surgical complications has been associated with perioperative hyperglycemia, Insulin therapy is recommended to maintain normoglycemia (< 8.3 mmol/L)[17].

During hepatectomy, vascular compression methods such as Pringle were avoided to reduce the chances of hepatic ischemia[17]. The Pringle maneuver is an example of an inflow occlusion method that involves clamping the hepatoduodenal ligament to interrupt blood flow in both the hepatic artery and portal vein. The subsequent decrease in venous return and increase in systemic vascular resistance can result in significant hemodynamic instability[15].

Postoperative management also played a very important role in the patient's improvement. Early prevention and treatment of hepatic encephalopathy are key to avoid prolonged neurological complications[18]. The use of lactulose and rifaximin improved ammonia elimination and reduced neurotoxicity, resulting in a faster recovery[19,20]. The presence of postoperative liver failure was expected considering that a

future liver remnant of at least 50% is necessary for patients with cirrhosis and the patient had a remnant of 32.8%.

In the future, the incorporation of ERAS protocols (Enhanced Recovery After Surgery) in hepatectomies may further improve postoperative outcomes in cirrhotic patients[21]. These protocols are known to shorten hospital days and facilitate recovery because of preoperative optimization, reduction of inflammatory response and early postoperative mobilization. Additionally, minimally invasive real-time cardiac output monitoring could have further optimized hemodynamic management in the perioperative period by providing precise data for immediate therapeutic adjustments[22].

CONCLUSION

The general guidelines for the perioperative management of radical hepatectomy remain highly debatable depending on international guidelines, requiring a high level of medical judgment to reduce complications and optimize postoperative outcomes. The use of TIVA and specific hemodynamic strategies ensured the success of the surgery and the recovery of this high-risk patient. It is necessary to investigate how these factors influence the onset of complications and how they improve postoperative outcomes, as this will determine better strategies in cancer treatment.

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