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Transarterial Chemoembolization in Interventional Radiology

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Introduction

- Hepatocellular carcinoma (HCC) was the third leading cause of death by cancer in 2020. Across the globe, it is the fifth most common cancer (Ghanaati et al., 2021).
- Transarterial chemoembolization is used to treat cancer of the liver. The procedure administers chemotherapy to the malignancies in combinations of Lipiodol or drug-eluting beads (DEB).
- Conventional TACE procedure utilizes a mixture of lipiodol contrast agent, chemotherapy drugs, and an embolization agent.
- DEB-TACE- uses drug eluting beads that release chemotherapy over time.
- Currently, there are two FDA approved chemotherapy drugs including Doxorubicin and Irinotecan (Young, 2023).

Risk Factors

- Hepatitis B and Hepatitis C virus
- Heavy exposure to tobacco and alcohol
- Obesity
- Non-alcoholic fatty liver disease (Ghanaati et al., 2021)

Indications

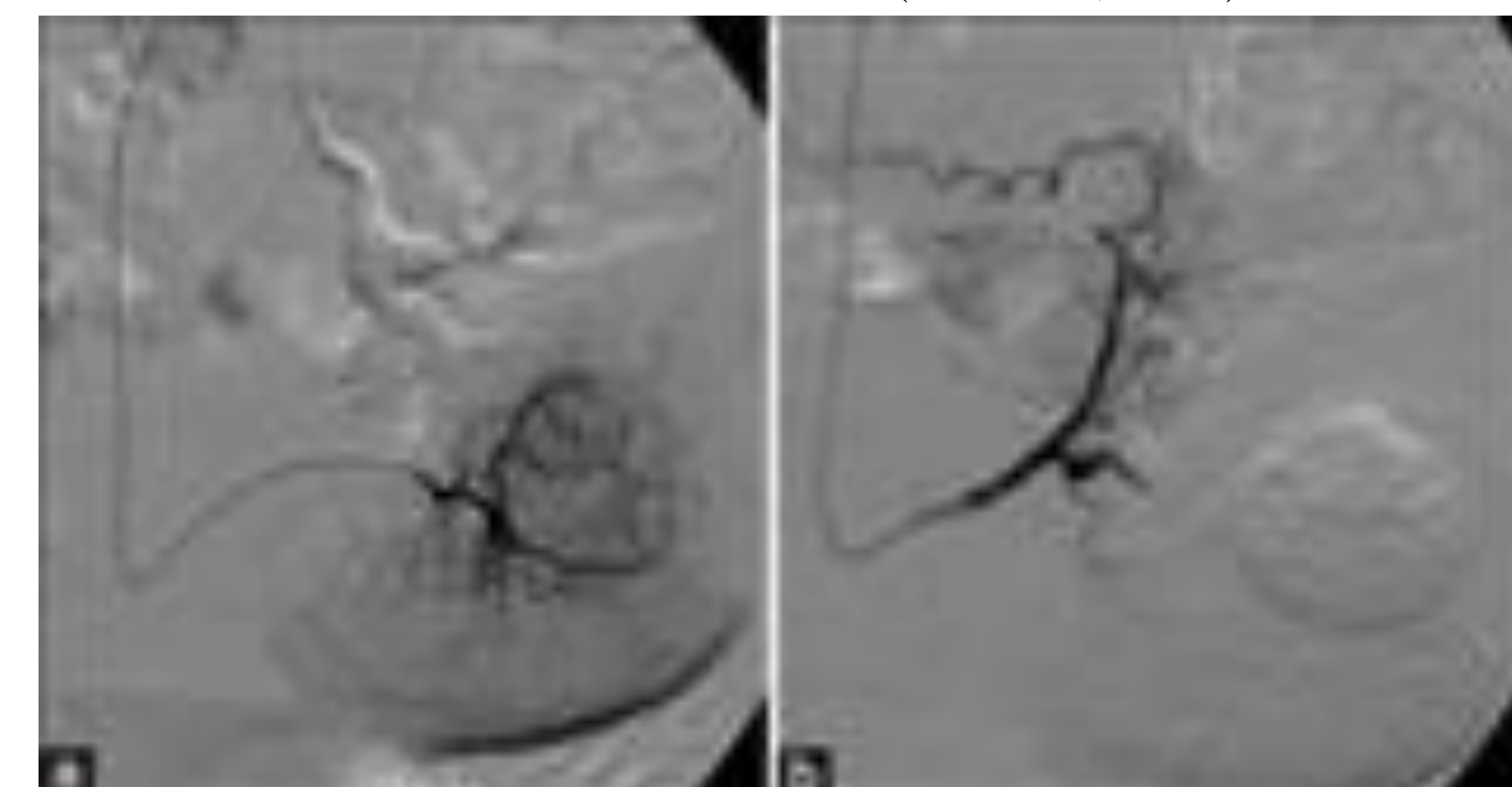
- The National Comprehensive Network (NCCN) uses a variety of criteria sets to determine if procedure should be done (Young, 2023).
- The TACE procedure is the first-line of treatment for individuals with stage B hepatocellular carcinoma. This means the patient has more than three nodules with one of the modules having a diameter larger than 3cm with satisfactory liver function (Lucatelli, 2023).

Contraindications

- The procedure may not be beneficial if the patient has a poor prognosis or expected survival time.
- History of heart or kidney failure causing chemotherapy drug intolerance
- Extra-hepatic metastases
- Poor liver function of end-stage cirrhosis
- Active alcohol consumer
- Tumors greater than 5 cm
- Availability of more effective procedure (Young, 2023)

Procedure

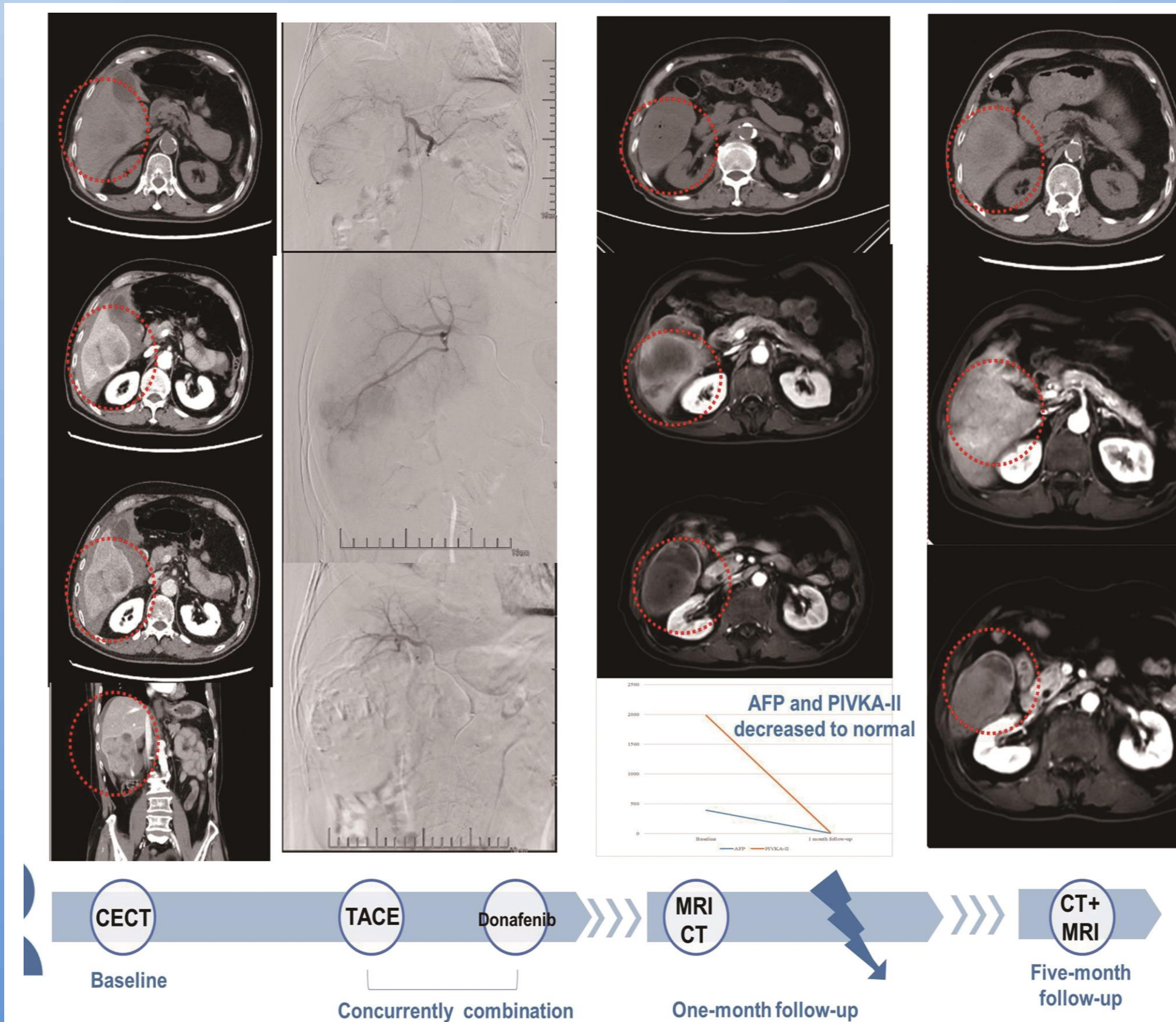
- The most common arterial access sites include femoral and radial arteries. Although not common, the brachial artery or distal transradial artery can be utilized.
- Arterial access is gained using a micro puncture needle. Once access is established, a sheath is inserted (Lucatelli, 2023).
- Selinger's technique is utilized. This includes first introducing a sheath into the artery followed by a catheter.
- The catheter is directed into the main hepatic artery.
- A microcatheter is inserted into the larger catheter to extend further into the specific vessels.
- Once the specific blood vessels have been determined, embolization particles will be used (Ghanaati et al., 2021).
- No more than 50% of liver should be embolized at once, meaning the patient may experience multiple embolization procedures (Young, 2023).
- Contrast is used throughout the procedure to utilize angiography. This allows for the blood flow within the vessels to be visualized (Lucatelli, 2023).



The angiogram on the left shows the blood vessels still feeding the liver, pre-embolization. The angiogram on the right shows the vessels post embolization. The vessels are no longer providing blood supply (Manjunatha et al., 2022).

Imaging

- CT or MRI is used in the procedure planning process.
- CT is used to confirm artery locations, assess vein patency and look for comorbidities such as bile duct obstruction.
- MRI is more beneficial in diagnosis of HCC due to higher sensitivity rates. MRI has the capability to show 78.8% of tumors larger than 3cm, which is the size criteria for this procedure (Lucatelli, 2023).



The image shows pre-procedure images of a patient with a large liver lesion, outlined in red. After undergoing DEB-TACE procedure, the next images were acquired one month and five months after. The patient experienced a complete response (Zhong et al., 2023).

Side Effects and Complications

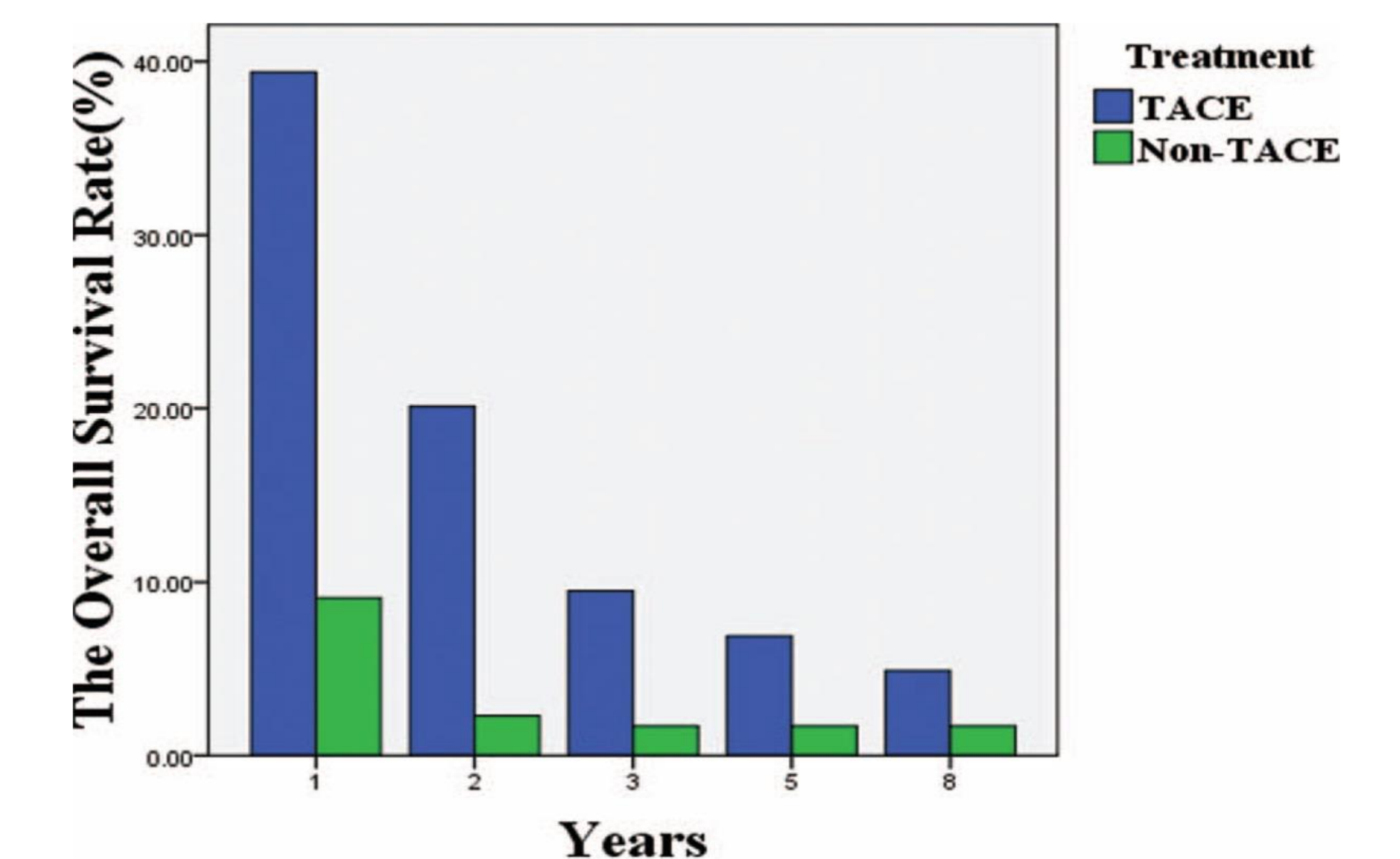
- Up to 80% of patients will experience post embolization syndrome exhibiting symptoms of fever, pain, nausea, and vomiting.
- The severity of the post-procedure syndrome is directly proportional to extensiveness of the procedure.
- Symptoms can appear anywhere from between the first hour post-procedure and ten days.
- Besides the manageable expected symptoms, only 5% of patients experience serious complications such as vascular complications, lung injury, liver abscesses, or hepatic rupture (Lucatelli, 2023).

Research on Efficacy

- A single center conducted study with 29 patients diagnosed with HCC.
- All participants were treated with a TACE procedure using drug-eluting beads.
- Using CT, MRI, and bloodwork levels to analyze data, the success of the procedure was determined.
- A significant decrease in lesion size was found between pre-procedure and post-procedure measurements.
- The AFP levels also significantly dropped, proving success of the treatment. Success may depend on cancer progression and size of microsphere used (Danışan & Arik, 2022).

Extending Survival Time

- A study consisting of 2386 patients who were treated with TACE procedure between January 2002 and December 2010.
- All patients had unresectable HCC. The purpose of the study was to compare survival rates with treatment vs without.



The Survival Rate of TACE vs. Non-TACE on Year 1,2,3,5,8

The bar graph shows the difference in survival time in patients who had the TACE procedure as treatment vs those who did not. The survival rates are compared at 1 year, 2 years, 3 years, 5 years, and 8 years (Kong et al., 2018)

Research on Adverse Effects

- A study conducted with 314 patients who underwent a DEB-TACE procedure within the timeframe of June 2019 to June 2021.
- Data was collected on how prevalent a liver abscess presented as a complication of the procedure.
- A liver abscess presented in patients 2.86% of the time.
- Out of 314 patients, 12 patients developed a liver abscess. 10 of these patients were able to make a recovery with antibiotics. The remaining two died of complications (Wang et al., 2023).

Conclusion

- The success rate is a complete response in 35% of patients and a decrease in tumor size for 25%.
- TACE is deemed to extend the 5-year survival rate of patients diagnosed with unresectable HCC (Manjunatha et al., 2022).
- As with all procedures, there is risk of complications. However, the risk of serious complications is relatively low. Therefore, patients should consider the risks vs. benefits of the procedure.