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RESEARCH AND APPLICATION OF HEPATECTOMY USING TON THAT TUNG METHOD COMBINED WITH TAKASAKI METHOD FOR MANAGING HEPATOCELLULAR CARCINOMA AT NGHE AN GENERAL FRIENDSHIP HOSPITAL

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LIST OF PUBLICATIONS RELATED TO THE THESIS TOPIC

1. **Nguyễn Huy Toàn, Hà Văn Quyết, Nguyễn Văn Hương và cs** (2022), Kết quả sớm của phẫu thuật cắt gan bằng phương pháp Tôn Thất Tùng kết hợp Takasaki điều trị ung thư biểu mô tế bào gan, *Tạp chí Y học Lâm sàng Bệnh viện Trung ương Huế,* (77), 90-96.

2. **Nguyễn Huy Toàn, Hà Văn Quyết, Nguyễn Văn Hương và cs** (2022), Đặc điểm kỹ thuật cắt gan bằng phương pháp Tôn Thất Tùng kết hợp Takasaki điều trị ung thư tế bào gan, *Tạp chí Y học Việt Nam*, 520(1B), 181-186.

3. **Nguyen Huy Toan, Ha Van Quyet, Nguyen Van Huong et al** (2022), Survival outcomes of the combination of extrafascial extrahepatic and extrafascial intrahepatic pedicle approaches in hepatectomy for hepatocellular carcinoma, *Clinical and Experimental Hepatology*, 8(2), 147-152.

INTRODUCTION

Primary liver cancer, mainly hepatocellular carcinoma, is a common malignancy in Vietnam and around the world. According to statistics from the International Agency for Research on Cancer (Globocan 2020), Vietnam has an estimated 26,418 new cancer cases each year and this is the 1st most common cancer in men and 5th in women. Vietnam is also a country with a high incidence of liver cancer due hepatitis B virus and hepatitis C virus infection.

Currently, there are many methods for treating hepatocellular carcinoma, such as: hepatectomy, liver transplantation, heat transfer, etc. However, hepatectomy is still considered as a basic and effective treatment.

Over time, hepatectomy methods and techniques have many progresses. Initially, non-anatomical hepatectomy might raise many risks such as bleeding, necrosis such as remaining liver tissue... Nowadays, hepatectomy in cancer has become safer and more effective thanks to the fact of understanding on structural - biliary vessels in the acute, segmental, and hypolobular liver; understanding of liver function, the amount of liver reserve needed and sufficient to maintain life ... The year of 1952 was considered the milestone of hepatectomy according to intrahepatic deconstruction by Lortat-Jacob and Robert. In 1963, Ton That Tung improved the technique based on the principle of searching and shortening the vessels in the liver parenchyma thanks to the clear understanding of the release of vascular fluid such as liver tissue. The advantage of this method is the quick surgery time, the reduction of complications due to anatomical abnormalities of the liver stem. However, this method requires experienced surgeons to identify natural grooves and skillful skills; control the entire liver pedicle that causes anemia of the whole liver, causing intestinal stasis, especially affecting patients with chronic liver disease and cirrhosis. In 1982, Henry Bismuth introduced a hepatectomy technique combining Ton That Tung and Lortat - Jacob methods. In 1986, Takasaki introduced the technique of controlled resection of the extrahepatic Glisson pedicle. This technique helps the surgeon to cut the liver according to the anatomy, clearly define the cutting area between segments, lower segments, minimize the ischemia of the remaining liver parenchyma and avoid spreading cancer cells to the other lobes during surgery.

In Vietnam, hepatectomy by Ton That Tung method combined with Takasaki-style liver stem control was initially published in the studies of Duong Huynh Thien, Ninh Viet Khai, Vu Van Quang, etc.; and had encouraging initial results with a successful pedicles control rate of 98.4 - 100%; and the rate of postoperative complications ranged from 1.3 to 17.8%.

Nghe An General Friendship Hospital, which is the final general hospital in the North Central region, since 2010, has performed hepatectomy according to Ton That Tung method in the treatment of hepatocellular cancer. However, there have been no studies evaluating the technique and results of Ton That Tung hepatectomy combined with Takasaki method.

From that practical situation, we carried out the project "***Research and application of hepatectomy using Ton That Tung method combined with Takasaki method for managing hepatocellular carcinoma at Nghe An General Friendship Hospital*** " with 2 target:

1. Study on characteristics of pathological lesions related to indications and techniques of hepatectomy using Ton That Tung method combined with Takasaki method for managing hepatocellular carcinoma .

2. Evaluation of the results of hepatectomy using Ton That Tung method combined with Takasaki method for managing hepatocellular carcinoma at Nghe An General Friendship Hospital.

Scientific and practical significance of the thesis:

Hepatectomy for hepatocellular carcinoma is a significant, difficult surgery with many risks during and after surgery, especially bleeding, liver failure, postoperative recurrence. Therefore, more research is needed. In-depth research on this issue aims to improve and apply advantages of surgical methods combining modern means into hepatectomy to improve treatment efficiency and quality of life for patients with hepatocellular cancer that surgery is indicated.

The thesis studied the application of hepatectomy using Ton That Tung method combined with Takasaki method for managing hepatocellular carcinoma at Nghe An General Hospital in order to improve the quality of treatment for patients, and at the same time to research and improve about techniques to better promote the advantages of each method to bring good results to patients, limit complications, reduce blood loss, liver failure after surgery.

The research results brought in the thesis have confirmed that hepatectomy using Ton That Tung method combined with Takasaki is a safe and effective technique in treating patients with hepatocellular cancer and can be performed in provincial hospitals across the country.

Dissertation layout:

The thesis consists of 150 pages: 2 pages of problem statement, 37 pages of literature review, 29 pages of research objects and methods, 33 pages of research results, 46 pages of discussion, 2 pages of conclusion and 1 page of recommendations.

The thesis has 43 tables, 22 charts and 36 figures. There are 160 references (28 documents in Vietnamese and 132 documents in English).

Chapter 1
LITERATURE REVIEW

1.1. ANATOMY, DIVISION AND TRANSFORMATION OF LIVER ANATOMY

1.1.1. Liver anatomy

The liver is the largest organ in the body, accounting for 2% of body weight in adults and 5% in newborns. It is an essential organ for life because it performs many of the metabolic activities necessary for homeostasis, nutrition, and resistance. The liver is the heaviest organ in the body. At death, the average weight is 1500g, and when alive, it contains 800-900g of blood, weighting 2,300-2,400g, and the size also varies with physiological and pathological conditions. Men's livers are usually heavier than women's.

1.1.2. Liver division

The division of liver lobes is based on the distribution of components in the Glisson capsule (portal vein triad, hepatic artery and biliary tract) and hepatic vein. In general, there has been a consensus on how to divide the liver lobes in the world and have been co-operatively performed by surgeons.

1.1.2.1. Couinaud

Couinaud relies on the portal vein to divide the liver. He took the middle slit (the main portal slit) to divide the liver into two parts, the right and left half of the liver. Next, each hepatopancreas is divided into two parts, each of which is called a region. Thus, Couinaud divided the liver into 4 zones: the left region, the left middle edge, the right middle edge, and the right side. The zones are further divided into segments numbered 1 to 9 clockwise viewed from the upper side of the liver.

1.1.2.2. Ton That Tung

According to Ton That Tung (1963), the noun liver lobe should only be used to call the classical lobes according to the external shape of the liver: the right and left lobes are separated by the cleft of the round ligament or the umbilicus, the rest of the liver is divided according to the distribution of the biliary tract.

1.1.2.3. Takasaki

The intrahepatic components of the Glisson pedicle are continuous with the extrahepatic because they are anatomically similar. This structure includes the hepatic artery, portal vein, and biliary tree, which is covered with connective tissue and then enclosed by the peritoneum to form a fibrous bundle (called a Glisson capsule). Thus, the hepatoduodenal ligament can be considered as the main body of Glisson's pedicle, extending into two branches at the hilum; right and left main branches. The right branch is divided into two secondary branches, while the left branch continues to be a horizontal section with the secondary branch.

1.1.3. Anatomical changes at the hepatic pedicle and its applications

Hepatectomy has only been developed and perfected thanks to the discovery of the anatomical structure of the liver, especially the division of the liver, and the abnormal changes in the structures in the liver including the hepatic artery, the hepatic

vein, portal vein, and biliary tree. Understanding the abnormal liver anatomy is an important first step in liver surgery in general and anatomical hepatectomy in particular, avoiding mistakes and complications after surgery.

1.1.3.1. Changes in hepatic artery anatomy

The hepatic artery is the most variable part of the hepatic pedicle. Through many studies by dissection, injection of color indicator, erosive specimen making, liver angiography by authors such as Couinaud (1957), Michels (1960), Trinh Van Minh (1971), Hiatt (1994) , Nettle F (1995), Trinh Hong Son (1998), Varotti (2004) gave many classifications.

1.1.3.2. Anatomical changes of the portal vein

Portal vein is the least variable component, anatomical changes of portal vein can be: change in origin, change in relatedness, change in the same sector. Anatomical change is a type of variation that is of great interest in surgery.

1.1.3.3. Anatomical changes of the biliary tract

Knowledge of extrahepatic biliary tract anatomical changes is essential in the practice of hepatobiliary surgery. The left hepatic duct has little change, whereas the right hepatic duct often has changes that according to Couinaud this tube is not found in over 43% and according to Ton That Tung it is over 55%.

1.1.4. Anatomy of Laennec's capsule

Hayashi conducted studies on liver slides and found that there were structural differences between the Glisson capsule and the Laennec capsule. Sugioka et al believe that the Laennec capsule is an important structure for standardizing the technique of controlling the Glisson pedicle in hepatectomy. This concept demonstrates the advantages of the Glisson pedicle control technique according to Takasaki.

1.1.5. Physiological functions of the liver

The liver is the body's largest gland, with many complex functions. Summary of the main functions of the liver:

The liver is an organ that stores, synthesizes, excretes, metabolizes, and coagulates blood.

- The function of creating and destroying red blood cells.
- Protective function of the liver.

1.2. HEPATOCELLULAR CARCINOMA DIAGNOSIS

1.2.1. Diagnosis of hepatocellular carcinoma

In the world, there are many research associations on diagnostic criteria and guidelines for hepatocellular cancer diagnosis. Two commonly used diagnostic protocols are those of the American Association for the Study of Liver Diseases (AASLD) and the European Association for the Study of Liver Disease and Cancer (EASL-EORCT).

1.2.2. Diagnosis stage

The diagnosis of staging is extremely important, essential, helps in prognosis and provides appropriate treatment). To date, there is no consensus staging system for worldwide use. However, the BCLC system contains all 3 factors: tumor

characteristics, liver function and patient condition, thus ensuring the necessary criteria for the classification of HCC.

1.2.3. Some characteristics of lesions related to indications

Some characteristics of lesions of prostate cancer before surgery include: (1) liver function, (2) Alpha-FP before surgery, (3) characteristics of tumor (size and number), (4) condition portal vein thrombosis, (5) disease stage.

1.3. HEPATOCELLULAR CARCINOMA TREATMENT METHODS

1.3.1. Non-surgical treatments

* Radical treatment by local destruction methods

- Injection of Ethanol or Acetic Acid.
- High frequency or microwave heating.

* Temporary treatment

- Endovascular interventions.
- Systemic treatment with targeted drugs or immunosuppressants.

1.3.2. Surgical methods of treatment

1.3.2.1. Hepatectomy surgery

* Indications for hepatectomy.

- Solitary tumor, non-vascular invasion, unlimited in size or cases with ≤ 3 tumors on the same lobe of the liver.
- For cases with ≥ 4 tumors on the same lobe, liver resection can still be selected, but based on the surgeon's experience.
- When the tumor has thrombus in the Vp1 (lower segmental branch) or Vp2 (segmental branch) branch, hepatectomy can still be indicated.
- No signs of distant metastasis: bone, lung, brain...
- Liver tumor accompanied by metastatic lesions outside the liver that can be removed in surgery such as: hepatic hilar nodes, adrenal glands, diaphragm, great omentum...
- Liver function is Child-Pugh A, B.
- For large hepatectomy, additional criteria are required:

Sufficient residual liver volume: Remaining liver volume-to-body mass index (RLVBWR) > 0.8% or minimal residual liver volume-to-normal volume (RLVSLV) for complete liver Total normal is 20-30%, for patients with cirrhosis or hepatitis, the minimum RLVSLV must reach about 40%.

* Common hepatectomy surgery methods

- The method of hepatectomy according to the lesion (atypical hepatectomy): This is a method of removing the pathological part of the liver without paying attention to the vascular and biliary components of the part of the liver intended to be cut. This method often has many potential complications, complications and is not guaranteed in terms of oncology.

- Lortat-Jacob hepatectomy (Extrahepatic vascular control): This is a method described and reported by Lortat-Jacob in a case of right hepatectomy in 1952. The

principle of this method is dissection of the components in the Glisson capsule at the hilum, tie and cut the portal vein, hepatic artery, hepatic duct, dissect and force the hepatic vein into the inferior vena cava outside the liver parenchyma, then cut into the liver parenchyma.

- Ton That Tung hepatectomy method (Controlling blood vessels in the liver parenchyma): This method has 2 techniques of note, which are the pair of whole liver pedicles (Pringle Maneuver procedure) and Glisson pedicle resection in the posterior liver parenchyma when the liver parenchyma has been destroyed. The author describes the technique based on an in-depth understanding of the anatomy of the segmental and subsegmental boundaries of the liver. This technique is simple, fast and effective, especially in emergency cases, small hepatectomy, and at the same time avoids complications due to anatomical changes in the components of the liver stem, helping to save liver.

- Bismuth hepatectomy: This hepatectomy method combines two techniques (1) Technique to control Glisson pedicle in the capsule according to Lortat Jacob and (2) technique to approach Glisson pedicle in parenchyma according to Ton That Tung. This method overcomes the disadvantages of the above two methods and takes advantage of the advantages of each method.

- The method of hepatectomy according to Takasaki: First described by Takasaki 1986 in Japan and Launois 1992 in Western Europe. This is a simple and safe technique that helps to clearly identify the boundaries of liver segments for complete hepatectomy according to anatomical structure.

- Belghiti liver suspension method: This technique was first described by Belghiti in 2001 and quickly became widely applied in right hepatectomy.

- Endoscopic hepatectomy: is a minimally invasive technique. The advantages of this technique are less postoperative pain, short hospital stay, high aesthetics, and less blood loss.

1.3.2.2. Liver transplant surgery

Liver transplantation is considered to be the only or definitive treatment for some liver diseases. However, this is an expensive, complicated and dependent on human organ source, so liver transplantation is only performed on a carefully selected group of patients to ensure the best results.

1.3.3. Complications in surgery

1.3.3.1. Liver vein injury

Injury to the hepatic veins can occur during hepatic vein dissection for control (intrahepatic venous injury) or during parenchymal resection (intrahepatic venous injury.

1.3.3.2. Injury to the inferior vena cava

This is a serious complication, the patient can die immediately due to blood loss or air escape into the heart chamber.

1.3.3.3. Injury to the hepatic artery and portal vein

When selectively controlled hepatectomy, during dissection, it is possible to damage the hepatic artery and/or the portal vein.

1.3.3.4. Biliary tract injury

At the liver hilum, the right and left hepatic bile ducts are surrounded by the hilar array, so separate dissection is quite difficult and easy to cause damage.

1.3.3.5. Other Injury

When moving the liver, especially the right liver, it can cause damage to the diaphragmatic vein, right adrenal gland, right adrenal vein, and short hepatic vein.

1.3.4. Complications

1.3.4.1. Bleeding after surgery

Postoperative bleeding is a dangerous complication and one of the leading causes of death after hepatectomy.

1.3.4.2. Bile leak and residual outbreak

Postoperative bile leak occurs from 1.3-33%, is one of the complications related to liver failure and mortality after surgery.

1.3.4.3. Pleural effusion

Pleural effusion is a common complication after hepatectomy. The mechanism of this phenomenon is the process of liver mobility and dissection of the ligaments in hepatectomy, affecting the lymphatic circulation in this area.

1.3.4.4. Ascites

Ascites is a common complication after hepatectomy, especially when cirrhosis or liver dysfunction is associated.

1.3.4.5. Pneumonia

Pneumonia or lung infection is most common 3-5 days after surgery. Symptoms and signs may include chest tightness, shortness of breath, and cyanosis. Surgical trauma, prolonged bed rest, and limited coughing due to wound pain are major factors in predisposing to pneumonia or infection.

1.3.4.6. Liver failure after surgery

Postoperative liver failure is a feared complication after hepatectomy and is the main cause of surgical mortality. The risk of liver failure after surgery should be predicted before performing surgery, surgery is contraindicated in cases with high risk of postoperative liver failure.

1.3.4.7. Surgical wound infection

Incisional infection usually occurs within 1 week after surgery. Swelling and discharge at the site of the incision, or in the case of severe infection, bacteriological cultures may detect bacteria.

1.3.4.8. Postoperative death

Hepatectomy always has a high rate of complications and mortality compared to surgery of the gastrointestinal tract.

1.4. HEPATECTOMY TECHNIQUE BY TON THAT TUNG METHOD COMBINED WITH TAKASAKI

1.4.1. Implementation technique

- Anatomy control of right and left Glisson pedicles extrahepatic according to Takasaki

Cholecystectomy to expose the hepatic portal, perform dissection into the hilum to separate the hepatic pedicle from the liver parenchyma without incision of the liver parenchyma, we control the right Glisson pedicle and the left Glisson pedicle, thread the cord around the liver. Notably, ligation of small branches going directly from the Glisson pedicles to the liver surface helps to limit bleeding.

- *Anatomy of anterior and posterior Glisson pedicle control according to Takasaki*

The connective tissue was resected along the anterior segment Glisson pedicle, separating the pedicle from the parenchyma deep into the liver to expose the anterior aspect. We dissected into the midline pedicle of Glisson anterior and posterior lobes to expose the posterior aspect. After passing the wire through the anterior pedicle, it was easy to separate the two anterior and posterior segment Glisson pedicles.

- *Anatomy control of the Glisson pedicle of the segment (3rd branch)*

After controlling for the major Glisson pedicles, if one wishes to find the subsegmental Glisson pedicles, dissection should be performed along the Glisson pedicle to access the subsegmental Glisson pedicles. To control the pedicle of Glisson of segments 5 and 8, it is necessary to dissect along the anterior segment pedicle or to control the pedicle of segments 6 and 7, it is also necessary to dissect along the pedicle of the posterior segment Glisson to reach the pedicles of the lobes. Controlling the 4th segment lower Glisson pedicle was dissected to the right of the round ligament, while the 2nd or 3rd segment inferior Glisson pedicle was to the left of the round ligament.

- *Technique to break the parenchyma and cut the Glisson pedicle in the liver by Ton That Tung method*

Hepatic parenchymal disruption is the classic technique in which the liver parenchyma is compressed and broken between the fingers (digitoclasie) of the surgeons or Kelly's (Kellyclasie) to expose the blood vessels and bile ducts, these components will then be paired and cut apart. This technique is easy to learn, easy to do, simple, effective, cheap and is considered the standard technique in hepatectomy.

Advantages of combining the two methods:

Combining the methods of Ton That Tung and Takasaki in hepatectomy helps to limit the disadvantages that each individual method may encounter.

- Easily applied to all types of hepatectomy, large, segmental, and subsegmental hepatectomy.

- It is applied in many cases where the hilar cannot be accessed due to the large tumor sticking or infiltrating.

- Avoid complications due to anatomical changes of the liver pedicle.

- Hepatectomy saves the liver parenchyma, enough to remove the damage, it is not necessary to remove a large amount of liver parenchyma in the case of benign tumors or tumors in the middle segment.

- Resection of the liver according to the correct anatomy, clearly defining the cutting area between segments, subsegmentation, complete removal of segments or subsegments of the tumor-bearing liver including the liver parenchyma and the portal

vein at the root of the segment or segment. lower that segment. Therefore, it completely eliminates small metastases in liver segments when the tumor invades blood vessels helps to limit recurrence.

- Minimize remaining ischemia of liver parenchyma, reduce blood loss during surgery and avoid spreading cancer cells to other segments during surgery.

- Techniques help surgeons reduce complications: bleeding, liver failure after surgery, damage to abnormal components of the liver compared to applying each method of hepatectomy separately.

1.5. STATUS OF RESEARCH ON CONTROLLED HEPATECTOMY FOR HEPATOCELLULAR CARCINOMA IN THE WORLD AND IN VIETNAM

1.5.1. In the world

In the world, there have been many studies on the results of hepatectomy using the extrahepatic or intrahepatic Glisson pedicle control technique, as well as comparing different surgical methods in the treatment of hepatocellular cancer.

In 1952, Lortat - Jacob introduced his method of hepatectomy with the main principle of controlling blood vessels before parenchymal resection.

In 2010, Giordano studied on 2 groups. Resection of the large liver using the extrahepatic Glisson pedicle approach using an anastomosis machine and resection of the small liver using the extrahepatic, clamped Glisson pedicle approach. The results showed that selective pedicle-controlled hepatectomy gave good results and reduced ischemia of other parts of the liver.

In 2021, Makdissi reported combining the extrahepatic Glisson pedicle approach with hepatostomy in anatomical hepatectomy. This approach is a distinct modality to facilitate safe surgical resection.

1.5.2. In Viet Nam

Ton That Tung demonstrated his hepatectomy technique with the method of controlling and tying the Glisson pedicle in the parenchyma combined with a pair of temporary whole liver pedicles with interval style with a pairing time of 10 minutes, then 5 minutes. next.

Research by Doan Huu Nam on a total of 4062 HCC patients in the period 1995-2003 at Ho Chi Minh City Oncology Hospital General complications 5.2%, mortality after surgery 0.6%.

In 2011, Nguyen Cuong Thinh, Le Van Thanh studied hepatectomy technique combined with Ton That Tung, Lortat - Jacob methods to treat hepatocellular carcinoma with the result that TB surgery time: 116 minutes; blood loss TB: 300 ml; blood transfusion rate: 20%; mortality and complications were 1.3% and 14.3%.

1.5.3. In Nghe An

Hepatectomy for hepatocellular carcinoma in Nghe An has been implemented since 2010 by Ton That Tung method. In 2017, Nguyen Van Huong and his colleagues applied Ton That Tung hepatectomy technique combined with Takasaki to treat hepatocellular cancer with initial positive results.

Chapter 2
RESEARCH PARTICIPANTS AND METHODS

2.1. RESEARCH SUBJECTS

Including 83 patients who underwent hepatectomy by Ton That Tung method combined with Takasaki at Nghe An General Hospital from February 2017 to July 2021.

2.1.1. Selection criteria

- The patient was diagnosed with hepatocellular carcinoma by histopathology after surgery.
- Liver function Child - Pugh A, B.
- There are no signs of invasion of major blood vessels on preoperative CT or MRI such as inferior vena cava, portal vein trunk.
- Liver resection by Ton That Tung method combined with Takasaki.
- No evidence of distant metastasis: bone, lung, brain...
- Disease stage according to BCLC: A, B, especially in patients with stage C, only patients with segmental and subsegmental portal vein thrombosis were selected.
- Medical records with full contents to be studied.
- The patient consented to participate in the study.

2.1.2. Exclusion criteria

- Patients with hepatectomy but with other organ surgery such as stomach, colon ....
- Hepatectomy due to liver injury, blood loss due to ruptured liver tumor.
- There were serious medical diseases associated with: sepsis, severe coagulopathy, etc.
- The medical record did not have enough information needed for the study.

2.2. RESEARCH METHODS

2.2.1. Study design

Prospective descriptive study, clinical intervention without control from February 2017 to July 2021.

2.2.2. Sample size

Apply the formula to calculate sample size:

$$N = \frac{Z^2 (1-\alpha/2)\, p(1-p)}{d^2}$$

N: minimum number of patients
$Z^2(1-a/2) = 1{,}96^2$ for 95% confidence
d is the minimum allowed error, choose d=0.08

We chose the complication rate of surgery to be 14.5%, corresponding to p=0.145.

Substitute formulas with a minimum sample size of 75 patients.

At Nghe An General Friendship Hospital from February 2017 to July 2021, the study collected a sample size of 83 patients.

2.2.3. Surgical procedure

2.2.3.1. General Procedure

* *Anesthesia method*: General endotracheal anesthesia combined with epidural analgesia.

** Patient position and surgeon position*

The patient was lying supine, the two arms were perpendicular to the body, the legs were closed, the surgeon stood on the right side, the assistant operated on 1 stood on the left, the assistant operated on 2 stood on the same side of the surgeon.

Surgical steps by Ton That Tung method combined with Takasaki

Step 1: Open belly line

Step 2: Explore the abdominal cavity.

Step 3: Move the liver

Cut round ligament, crescent ligament, triangular ligament, coronary ligament, hepatoduodenal ligament (depending on tumor location). The goal is to move the liver widely so that the manipulation of the surgeon was most convenient and safe.

Step 4: Cholecystectomy, lymph node dissection, or pedicle dissection

Cholecystectomy is performed in cases when large hepatectomy or lobectomy, lobectomy of the right liver. After cutting the 6 Fr plastic tube into the cystic duct to check for bile leakage, postoperative biliary drainage.

Step 5: Controlling extrahepatic Glisson pedicles following the Takasaki approach

- Control the right and left liver Glisson pedicle.
- Control the anterior segment and posterior segment Glisson pedicle.

Step 6: Cut the liver parenchyma, process the Glisson pedicle in the liver by Ton That Tung method

- Determine the cutting line or plane cutting the liver: Based on the anatomical landmarks which are the grooves described in the liver division of Ton That Tung to determine the liver cut line.
- Hepatectomy according to Ton That Tung method: Cut the liver parenchyma first, treat the pedicle in the posterior parenchyma. This technique avoids liver anatomical abnormalities.

Step 7: Check for bleeding, bile leak, cover the cut area

Step 8: Drain, close the abdomen

2.2.4. Research indicators

The research indicators were collected according to the unified research case sample.

2.2.4.1. Research indicators on common characteristics

* Age and gender

* History of treatment of liver tumors: burning liver tumors; circuit button; surgery.

* Body Mass Index: BMI.

* Clinical features

- Symptoms: Abdominal pain, weight loss, ascites, large liver, palpable tumor.

* Paraclinical features

- Hematology and coagulation tests.
- Biochemical tests.
- Hepatitis markers.
- Characteristics of preoperative imaging on ultrasound and computed tomography.
- Preoperative liver biopsy.

2.2.4.2. Research indicators on characteristics of pathological lesions related to indications

- Assess liver function before surgery.
- Alphafetoprotein before surgery.
- Tumor size and number of tumors on computed tomography.
- Portal vein thrombosis on imaging.
- Classification of disease stage: According to BCLC.

2.2.4.3. Research indicators on technical characteristics of hepatectomy by Ton That Tung method combined with Takasaki

* The research indicators were arranged according to an 8-step process: (1) Laparotomy; (2) Exploration and assessment of the abdomen; (3) Liver mobility; (4) Cholecystectomy, dissection of hepatic pedunculated lymph nodes; (5) Control of extrahepatic Glisson pedicle by Takasaki method; (6) Cut liver parenchyma, handle Glisson pedicle in liver by Ton That Tung method; (7) Check hemostasis, bile leak, cover the cut area; (7) Place drainage, suture to close the abdomen.

**** Difficulties in surgical procedures.***

2.2.4.4. Research indicators on surgical outcomes

**** Intraoperative results***

- Time to cut parenchyma and surgery time.
- Amount of blood lost (ml).
- Patients with blood transfusion during surgery, after surgery.
- Postoperative pathological results.
- Classification of postoperative stage according to TNM.

**** Early results after surgery***

- Hematology, coagulation and biochemical indicators after surgery
- Early complications after surgery.
- Transit time (days).
- Time of drainage (days).
- Postoperative time (days).
- Classification of complications according to Clavien - Dindo.

**** Some factors related to complications, intraoperative results.***

**** Long-term results after surgery***

- Rate of recurrence and death at the end of the study.
- Survival rate at 1, 2 and 3 years.
- Disease-free survival time
- Overall survival time.
- Evaluation of some factors affecting disease-free and overall survival time.

2.2.5. Data processing

All data are processed by SPSS 26.0 software, using statistical algorithms to calculate mean values, percentages, using statistical tests to test, compare and find relationships. correlation (t-test, Chi-square).

Chapter 3
RESEARCH RESULTS

From February 2017 to July 2021, there were 83 eligible patients included in the study, we draw the following results:

3.1. GENERAL CHARACTERISTICS

3.1.1. Age and gender

* Age: There were 56.6% of patients aged 40 - 59 years old, age under 40 accounts for the lowest rate with 10.8%. Average age 53.23 ± 10.47 (30-73).

* Gender: Men accounted the majority with 68.7%, male/female ratio was 2.2/1.

3.1.2. History of treatment for liver tumors

Among the studied patients, there were 5 patients with preoperative embolization, accounting for 6%.

3.1.3. Body mass index

Average height (cm)160.73 ± 6.45; Average weight (kg) 52.67 ± 7.71; The average BMI of the study subjects was 20.33 ± 2.312.

3.1.4. Clinical and paraclinical features

3.1.4.1. Clinical symptoms

Abdominal pain 49 patients (59%), weight loss and abdominal fluid in 15 patients (18.1%).

3.1.4.2. Subclinical symptoms

** Hematology and Prothrombin tests*

Red blood cell count 4.56 ± 0.86 (T/l); platelets 190 ± 64.4 (G/l). Prothrombin TB rate 102.4 ± 18.42%.

** Biochemical tests*

Average Creatinine Index 79,352 ± 1.36 µmol/L; Total bilirubin average 11.7 ± 4.35 (µmol/l); Blood albumin average 39.27 ± 5.19 g/l.

** Marks of hepatitis*

Hepatitis B with 66 (79.5%); hepatitis C 1 (1.2%).

** Characteristics of preoperative imaging*

Abdominal fluid detected on ultrasound and CT is 19.3%, 16.9%, respectively. Portal vein thrombosis accounted for 3.6% on both ultrasound and CT.

** Preoperative liver biopsy*

There were 27 (32.5%) liver biopsies before surgery.

3.2. CHARACTERISTICS OF PATHOLOGICAL LESIONS

3.2.1. Liver function before surgery

** Child Score - Pugh, MELD, ALBI*

Child-Pugh mean score 5.36 ± 0.72. MELD average score 7.04 ± 1.37, ALBI average score -2.65 ± 0.438.

** Child-Pugh score*

Child A patient 76 (91.6%), there are 7 (8.4%) Child B patient.

** ALBI scale*

Level 1 ALBI has 50 (60.2%).

** Esophageal vein dilation*

Grade I is 7 (11.5%), there are no patients with grade 2 and grade 3 stretch.

** Liver volume before surgery*

There were 20 patients with major hepatectomy and all of the residual liver volume-to-body weight ratios were > 1%.

3.2.2. Alphafetoprotein before surgery

AFP index was below 20 ng/ml with 37 (44.6%), AFP level > 1000 with 24 (28.9%).

3.2.3. Size and number of tumors on computed tomography

Patient has 1 tumor and size < 2 cm, 2-5 cm, > 5 cm, respectively, 1.2%; 41%; 43.4%. The tumor cell size was 5.52 ± 2.71 cm.

3.2.4. Portal vein thrombosis

There were 3 patients with portal vein thrombosis.

3.2.5. Disease stage

* Classification of disease stage according to BCLC

BCLC stage A 60 (72.3%); BCLC B 17 (20.5%).

3.3. HEPATECTOMY SPECIFICATION

3.3.1. Step 1 - Opening the abdomen

The proportion of patients undergoing laparotomy according to the subcostal line and the J line was quite similar, 39.8% and 37.3%, respectively.

3.3.2. Step 2 - Assess the abdomen

There was parenchyma at the level of mild fibrosis with 59%, primary cirrhosis 12.1%; Tumor ruptured before surgery 12 (14.5%), tumor adhered to the diaphragm 8 (9.6%) and 44 (53%) patients had lymph nodes in the hepatic pedicle.

3.3.3. Step 3 - Liver Mobility

Mobility of the whole right liver was 21.7%, the whole left liver was 8.4%; Liver mobility after Glisson pedicle control was 7.2% and the rate of active diaphragmatic resection with liver mobility was 3.6%.

** Complications when moving the liver*

Complications of tumor rupture 2 (2.4%); 1 (1.2%) tear parenchymal liver.

3.3.4. Step 4 - Cholecystectomy, lymph node dissection, or pedicle dissection

There were 29 (34.9%) cases needing Escart sonde.

There were 44 (100%) patients with liver stem lymph node dissection and 3 (6.8%) patients with immediate biopsy results (+).

3.3.5. Step 5 - Controlling extrahepatic Glisson pedicles following the Takasaki approach

Right hepatic pedicle control was 60 (72.3%), 100% pedunculated by Takasaki method.

** Stem dissection time*

The time of dissection of the right and left pedicles was 3.9 ± 2.15, the anterior

and posterior pedicles were 4.9 ± 1.82 and the lower segmental pedicles was 3.7 ± 1.9.

* *Complications*

During dissection of the Glisson pedicle, 1 patient had portal vein damage (1.2%) and 3 patients had peri-pedunctal parenchymal bleeding (3.6%).

3.3.6. Step 6 - Cut parenchyma, handle Glisson pedicle in liver by Ton That Tung method

* Means of parenchymal cutting

There were 62 (74.7%) patients using 3 means of hepatectomy.

* How to handle Glisson pedicle

All patients had parenchymal resection before pedicle treatment, 57 (68.7%) patients were sutured to extract the pedicle and 26 (31.3%) patients were treated by 8th suture and pedicle tying. .

3.3.7. Step 7 - Check for hemostasis, bile leak, cover the cut area

There were 52 (62.7%) patients checked for bile leaks using white gauze; 71 (85.6%) patients were covered with surgicel coating.

3.3.8. Step 8 - Place drainage, close abdomen

- Biliary drainage: 6/83 patients.

3.3.9. Difficulties in the surgical procedure

There were 38 (45.8%) patients having difficulties in the surgical procedure.

3.4. SURGERY RESULTS

3.4.1. Results in surgery

* *Classification and morphology of hepatectomy*

There were 20 (24.1%) patients with major hepatectomy and 63 (75.9%) patients with small hepatectomy.

* *Parenchymal cutting time and surgery time*

Time to cut parenchyma TB 37.43 ± 9.94 minutes. Surgical time TB 159.70 ± 53.12 minutes.

* *Amount of blood loss and transfusion*

Total blood loss 247.32 ± 145.145 ml.

* *Pathological results after surgery*

- Safe margin of tumor < 0.5 cm; 0.5 - 1.0 cm; > 1.0 cm is 3 (3.6%), 44 (53%), 36 (43.4%).

- Moderately differentiated 76 (91.6%), highly differentiated 4 (4.8%) and 3 (3.6%) poorly differentiated.

* *Classification of disease stage after surgery according to TNM*

According to TNM stage classification, in stage IA 1 (1.2%), IB 56 (67.8%), IIIA 15 (18.1%), IIIB have 8 (9.6%).

3.4.2. Early results after surgery

* *Coagulation and biochemical indicators after surgery*

The patient's albumin TB index decreased slightly after surgery. Total preoperative bilirubin was 25.43 ± 13.44, increased on the 3rd day after surgery was 30.52 ± 18.57, but decreased to 21.49 ± 13.47 on the 5th postoperative day.

** Hematology index on day 1, 3, 5 after surgery*

The erythrocyte index, hemoglobin and hematocrit had a slight decrease after surgery due to blood loss. The patient's average platelet count on day 1 was 184.46 ± 69.52, increased to 196.71 ± 102.54 on day 5 after surgery.

** Symptoms*

The most common complication after surgery was pleural effusion, found in 22 patients, accounting for 26.5%, followed by ascites with 14 patients accounting for 16.9%, only 1 case of postoperative liver failure accounting for 1.2% and there was no cases of intra-abdominal bleeding or death.

** Classification of complications according to Clavien - Dindo*

There were 32 patients with postoperative complications, accounting for 38.6%, of which mainly grade I complications with 29 patients accounted for 34.9%, and 2 patients with grade IIIA (2.4%).

** Recovery time after surgery*

The time the patient started having bowel movements after surgery, TB was 2.99 ± 0.45 days, the time after surgery was 10.82 ± 3.40, patients were at least 7 days and at most 25 days.

3.4.3. Long-term results after surgery

3.4.3.1. Rate of recurrence and death at the end of the study

At the end of the study: 13 recurrence rate (15.7%); mortality rate 22 (26.5%).

3.4.3.2. Survival time after surgery

Estimated average overall survival time: 40.68 ± 2.17 months.

Estimated average disease-free survival time: 32.58 ± 2.56 months.

Disease-free survival at 1 year 67.1%, 2 years 56%, 3 years 53.1%; Overall survival at 1 year 88.4%, 2 years 76.3%, 3 years 69.5%.

* Some factors affecting disease-free survival time: AFP concentration; Tumor size; tumor with shell; lymph node metastasis; Child-Pugh; Surgical margin ; Portal vein thrombosis; The stage of the disease according to BCLC.

* Some factors affect the overall survival time: Tumor size; tumor with shell; lymph node metastasis; Child-Pugh; Surgical margin; Portal vein thrombosis; The stage of the disease according to BCLC, Spontaneous rupture.

Chapter 4
DISCUSSION

4.1. GENERAL CHARACTERISTICS

4.1.1. Age and gender

The study group consisted of 83 patients, the youngest age was 30 years, the oldest was 73 years old, the mean age was 53.23 ± 10.47 years old, in which the most common age group was from 40 to 59 years old, accounting for 56.6%, the age under 40 years old. accounted for the lowest rate with 10.8%. Our research was also

consistent with a number of domestic and foreign authors ranging from 52 to 58 years old.

In this study, the prevalence of HCC in men accounted for the majority: 68.7%, the male/female ratio was 2.2/1. The obtained research results were similar to those of the authors Fong 2.46/1, Bai Ji 2.57/1. Lower than some other studies such as Dang Huu Nam 4/1; Duong Huynh Thien 8.3/1; Cough 6/1. According to GLOBOCAN 2020 data, the male:female ratio in Vietnam is 3.87/1.

4.1.2. History of treatment for liver tumors

In our study, 5 patients had the history of treatment for HCC, accounting for 6% of patients receiving TACE alone, of which 3 patients were treated with TACE due to ruptured liver tumors. According to Ome et al. 2019, patients with a history of HCC treatment with TACE or RFA 13.9%, preoperative chemotherapy 15.2%.

4.1.3. Body Mass Index

In our study the average BMI was 20.33 ± 2.31, this result was similar to Zhou's (2020), which studied on 488 patients with HCC, and found that average BMI was 22.2 ± 3.1.

4.1.4. Clinical and subclinical symptoms

4.1.4.1. Clinical symptoms

The main clinical manifestations were abdominal pain, accounting for 59%, weight loss 18.1%, clinical peritoneal fluid 18.1%, of which 14.5% peritoneal fluid is blood due to ruptured tumor, enlarged liver 9.6%, palpable tumor accounts for 2.4%. A multicenter study in North America, Europe, and Asia Arnaoutakis (2014) showed that the predominant clinical symptoms were abdominal pain (53%), anorexia (15%), weight loss (12%) and 6% of patients found a tumor in the abdomen.

4.1.4.2. Subclinical symptoms

** Hematology and Prothrombin tests*

In the study, most of the patients had hematological indexes within the normal range. The rate of prothrombin TB in the study was 102.4 ± 18.42% and all patients had a prothrombin rate > 65%. The results of Prothrombin ratio obtained were similar to the statistics of Vu Van Quang (2019): 97.85 ± 12.62%; Zhou (2020) 195.9 ± 76.3.

** Biochemical tests*

Regarding blood biochemical index, all patients had normal renal function. Blood albumin average 39.27 ± 5.19 g/l; The maximum total bilirubin 11.7 ± 4.35 μmol/l in the study was 34.6 μmol/l. Blood albumin average 39.27 ± 5.19 g/l, there were 6 patients with blood albumin < 35 g/l, accounting for 19.9%. Akkiz's study (2021) showed that the survival time after surgery was directly proportional to albumin concentration.

** Marks of hepatitis*

The results of the study showed that: patients infected with hepatitis B virus were 66 (79.5%); hepatitis C virus 1 patient (1.2%); 1 patient co-infected with hepatitis B and C virus, accounting for 1.2%. 15 patients, accounting for 18.1%, did not have

hepatitis virus. The results were similar to the study of Duong Huynh Thien (2016); Wang (2016); Lee (2017).

** Characteristics of preoperative imaging*

Diagnostic imaging plays an important role in diagnosing and determining HCC, in addition to contributing to the selection and appointment of appropriate treatment methods. In the study, CT detected 100% of cases of liver tumors, irregular liver border image 48.2%, abdominal fluid 16.9%, portal vein thrombosis 3.6%.

** Preoperative liver biopsy*

In our study, 27 patients, accounting for 32.5%, had a liver biopsy before surgery. This result was similar to that of author Vu Van Quang (2019), 28.3% of patients had preoperative biopsies; Trinh Quoc Dat (2020) had 10.3%.

4.2. CHARACTERISTICS OF PATHOLOGICAL LESIONS RELATED TO INDICATIONS

4.2.1. Liver function before surgery

In hepatectomy for HCC, liver function is considered a very important factor, related to complications and mortality after surgery. Therefore, liver function is often evaluated and scrutinized by surgeons.

Child - Pugh scale: The results of the study showed that the proportion of patients with Child A was 91.6%; Child B was 8.4%; Child C had no patients. Similar results with author Chang (2018), on Child - Pugh classification in the group of 446 patients undergoing hepatectomy for HCC, found: Child A: 90.49% %, Child B: 9.51 %.

ALBI scale: In our study, ALBI grade 1 had 50 (60.2%), grade 2 33 (39.8%). This result was similar to the study of Wang (2016) Li (2018).

MELD score: MELD score has predictive value of mortality risk of patients with cirrhosis after hepatectomy. Cirrhotic patients with a MELD score of 11 are at high risk of liver failure and postoperative mortality, therefore it is recommended to switch to nonsurgical approaches such as thermal ablation or chemotherapy and liver transplantation whenever possible. body. However, MELD is of little value in predicting postoperative mortality in hepatectomy patients without cirrhosis.

Esophageal varices: In the study, 61 patients underwent esophagogastroduodenoscopy and found 7 patients (11.5%) dilated oesophagus, no grade 2,3 dilation. According to a study by Nguyen Duc Thuan (2019), esophageal varices of grade 1,2 were found to be 10.2% and 0.4%, respectively; a study by Chang (2018) grade 1,2,3 esophageal varices were 12.5%, 5.4%, respectively; 2%.

Remaining liver volume: In this study, all cases of major hepatectomy were measured preoperative liver volume to calculate the remaining healthy liver volume. The term small liver syndrome is widely used in transplantation. liver and large hepatectomy for treatment of HCC. To avoid this syndrome it is necessary to have a residual liver volume/body weight ratio > 0,8% or a residual liver volume/standard liver volume ratio ≥ 30%. This conclusion is agreed by many hepatobiliary surgeons in the world.

4.2.2. Alphafetoprotein before surgery

Alphafetoprotein (AFP) is an important marker in the diagnosis of HCC, previously relying only on high AFP levels and tumor ultrasound images was enough to diagnose HCC. In our study, the AFP TB value was 2579.13 ± 8558 ng/mL, patients with AFP < 20ng/ml accounted for the highest rate of 44.6%. In which, there were 24 patients with AFP concentration > 1000 ng/ml, accounting for 28.9%. The results obtained were similar to the statistics of Lee (2017), found that the group with AFP < 400 ng/ml accounted for 72.9%, AFP ≥ 400 ng/ml accounted for 27.1%. The latest recommendations of the latest diagnostic guidelines of the American Association for the Study of Liver Diseases (AASLD) in 2011 and the European Association for the Study of the Liver (EASL) in 2012 did not exclude AFP from the diagnostic criteria for carcinoma. liver cells.

4.2.3. Size and number of tumors

The number of patients with 1 tumor and 2-3 tumors on CT film was 71 (85.5%) and 12 (14.5%), respectively; The tumor size on CT film was 5.52 ± 2.71 cm. In the study with 12 patients with 2-3 tumors, we still decided to operate because the tumors were located in the same lobe or 1 lobe of the liver to be resected. The latest APASL treatment guidelines for breast cancer in 2017, AASLD in 2018, Vietnam Ministry of Health 2020, Japan Hepatobiliary Association (JSH) 2021, tumor size was not a contraindication to hepatectomy.

4.2.4. Portal vein thrombosis

In this study, we found that: Thrombosis of the portal vein of the inferior segmental branch was presented in 1 patient (1.2%) and the segmental portal vein was presented in 2 patients (2.4%), the rate of blood portal vein mass in the study was 3.6%. The overall survival time of the group with portal vein thrombosis and the group without portal vein thrombosis was 9 ± 3.51 months and 41.98 ± 2.12 months, respectively, this difference was statistically significant with $p<0.05$.

4.2.5. Disease stage

In our study, stage A according to BCLC classification accounted for: 72.3%. The results were different from the study of Vu Van Quang (2013): Classification according to BCLC stage A accounted for 93.4%; Study Cough (2021) classified by BCLC stage A accounted for 79.3%, stage B accounted for 20.7%.

4.3. SPECIFICATION OF HEPATECTOMY

4.3.1. Step 1 - Opening the abdomen

In this study, we had: 39.8% of J-shaped, 37.3% of bilateral lower costal, 22.9% of midline upper and lower umbilicus, no patient had Mercedes line.

4.3.2. Step 2 - Assess the abdomen

Evaluation of tumor status in our surgery showed that: liver tumor spontaneously ruptured in 12 patients (14.5%), tumor adhered to diaphragm in 8 patients (9.6%), adhered to liver pedicle in 1 patient. 1.2%).

4.3.3. Step 3 - Liver Mobility

Liver mobility is a very important step in hepatectomy. Good liver mobility helps surgeons manipulate and access lesions easily, creating favorable conditions in the process of cutting liver parenchyma and handling complications if any.

4.3.4. **Step 4 - Cholecystectomy, dissection of hepatic pedunculated lymph nodes**

In all cases with liver tumor on the right side of the crescent ligament, we performed cholecystectomy to facilitate dissection control of the right hepatic Glisson pedicle, posterior or anterior segment, in addition to cholecystectomy with drainage through the cystic duct (sonde Escart) also to check for bile leakage after hepatectomy.

4.3.5. Step 5 - Controlling extrahepatic Glisson pedicles following the Takasaki approach

In our study for tumors located in the right liver, control of the right Glisson pedicle followed by control of the anterior and posterior segment glisson pedicles. The next step will determine exactly which segment the tumor is located in by marking the ischemic area at the liver surface during temporary ligation of the corresponding segmental pedicles. For the left liver tumors we only controlled the left Glisson pedicle. In a special case, the tumor is located in the middle of the lower lobes 4-5-8, so we have to control the right and left Glisson pedicle, anterior and posterior segments. This explains the greater number of Glisson pedicle controls than the number of hepatectomy patients.

Glisson pedicle control is considered successful when it comes to exposing and placing the necessary means of active control of the Glisson pedicles; to this end, evaluation of the major Glisson pedicle (right, left, anterior segment, and segmental segmentation is required). posterior lobe) on preoperative computed tomography and magnetic resonance imaging is very important, especially the anatomical variations of the portal vein as this is the main cause of failure of Glisson pedicle control in hepatectomy.

4.3.6. Step 6 - Cut parenchyma, handle Glisson pedicle in liver by Ton That Tung method

* *Cut liver parenchyma.*

To conduct liver parenchymal resection, many different tools can be used such as: Kelly pliers, electric knife, ultrasound knife, CUSA, even manual or a combination of the above means. Based on Ton That Tung's principle of hepatectomy, we determined the plane of liver cutting according to the landmarks and grooves described in liver division to perform hepatectomy combining the boundary between the discolored area due to ischemia (after clamping the Glisson pedicle corresponding to the portion of the liver intended for resection) and normal on the liver surface. In the study, we only used electric knives, ultrasonic knives and kelly pliers without using CUSA, according to table 3.23 it shows that: set of 3 (electric knife + Ultrasonic knife + Kelly) is used the most (74.7%), electric knife + Kelly accounted for 25.3%. In the process of cutting liver parenchyma, small vascular branches are cut and sewn with silk thread, small Glisson pedicles are sutured with 4/0 prolene thread or 4/0 vicryl thread.

** Processing Glisson pedicles in the liver*

When cutting liver, especially for right and left hepatectomy, we thoroughly apply the main principle in Ton That Tung hepatectomy method which is to find and tie the portal pedicles and hepatic veins right in the liver parenchyma after hepatectomy. parenchymal cut. According to Table 3.24, all patients had parenchymal resection before pedicle processing, 57 patients (68.7%) were sutured and 31.3% of patients were treated by stitching pedicle.

In the case of right hepatectomy, when controlling the right pedicle of Glisson outside the liver, we removed the liver parenchyma, clearly revealing the 2 pedicles of Glisson in the anterior and posterior segments, then clipped the two pedicles of those segments separately in the liver. The location of glisson pedicle resection is as close to the entry into the liver parenchyma as possible, when such ligation will reduce complications due to anatomical changes, especially the biliary tract, because this is the boundary between the intrahepatic and extrahepatic regions. According to Ton That Tung, vascular ligation in the liver parenchyma is always safe in hepatectomy, changes in the anatomy of the extrahepatic bile ducts affect hepatectomy, anatomical changes of intrahepatic bile ducts have little effect. to anatomical hepatectomy. Some authors believe that: ligation of Glisson's pedicle as close to the liver parenchyma as possible to be resected and sutures must be performed to avoid slipping of Glisson's pedicle.

4.3.7. Step 7 - Check for hemostasis, bile leak, cover the cut area

In our study, there were 2 methods used to check for bile leakage: (1) Using white gauze to press the liver surface for 1-3 minutes, accounting for 62.7%; (2) Pumping physiological saline mixed with methylene blue through Escart tube accounts for 37.3%; Covering the cut area: Suture 2 edges of liver 3.6%, Cover Surgicel 85.6%, Cover large omentum 2.4%. Vu Van Quang (2019) covered the cut area with surgicel accounting for the highest rate (87.8%), surgicel combined with the great omentum (7.5%), did not cover the cut area (4.7%).

4.3.8. Step 8 - Place drainage, close abdomen

All our patients after surgery were placed under the liver drainage or hepatectomy. This result is similar to that of domestic and foreign authors: Nguyen Dinh Song Huy (2016), Vu Van Quang (2019), Kajiwara (2016)… The authors believe that drainage after hepatectomy is necessary because in addition to Drainage of fluid and residual substances also helps in early detection of complications such as bleeding and leakage of bile.

4.3.9. Difficulties in the surgical procedure

The problem of advantages or disadvantages depends on the qualifications, proficient surgical techniques and experience of the surgeons, so the surgeons must have a qualified training curve. In addition, it also depends on the assistant surgeons, tools, facilities, machinery and equipment are adequate according to technical requirements or not.

4.4. RESULT

4.4.1. Results in surgery

4.4.1.1. Classification and morphology of hepatectomy

The study results showed that there were 10 types of hepatectomy in which: hepatectomy was performed mainly by small hepatectomy (75.9%) of which the most were posterior and lateral segment hepatectomy (22.9%). Large hepatectomy accounted for (24.1%) of which: left hepatectomy (4.8%), right hepatectomy (13.3%). All cases of hepatectomy were performed surgically.

4.4.1.2. Parenchymal resection time and surgery time

The average time of general surgery was 159.7 ± 53.12 minutes, in which the time of large and small hepatectomy was 201.35 ± 42,735 minutes and 146.48 ± 49,349, respectively. The results of this study were similar to the study of Karamarkovic (2016), the time of TB surgery with small hepatectomy was 105.1 ± 21.1 minutes, 225.6 ± 75.6 minutes with large hepatectomy.

The general parenchymal resection time was 37.43 ± 9.94 minutes, of which large hepatectomy was 44.10 ± 5.739, minor hepatectomy was 35.32 ± 10,080, the difference was statistically significant with $p < 0.001$.

4.4.1.3. Amount of blood lost and transfused

Intraoperative blood loss is always a concern in hepatectomy surgery, blood loss can occur in liver mobility, liver pedicle dissection or parenchymal resection. Total blood loss: 247.32 ± 145.145ml, of which large hepatectomy is 278.82 ± 126.17 ml and small hepatectomy is 237.41 ± 150.33 ml, the difference is not statistically significant list. Only 1 patient required intraoperative blood transfusion.

4.4.1.4. Pathological results after surgery

* Tumor differentiation: In our study, the tumor was highly differentiated 4.8%, the tumor was moderately differentiated 91.6% and poorly differentiated 3.6%.

* Safe margin: This is an index commonly used to evaluate the effectiveness and safety of oncology when performing hepatectomy for HCC.

* Classification of TNM stage after surgery: stage I has 57 (69.9%), of which IA accounts for 1.2%, IB accounts for 67.8%; stage III 23 (27.7%) of which IIIA 15 (18.1%) and IIIB 8 (9.6%).

4.4.2. Early results after surgery

4.4.2.1. Hematology, coagulation and biochemical indices after surgery

All patients in the study were monitored for blood chemistry and coagulation tests performed on days 1, 3, and 5 after surgery to monitor liver and kidney function. Creatinine index fluctuated within the normal range, the patient's TB albumin index decreased slightly after surgery.

4.4.2.2. Complications after surgery

Pleural effusion 26.5%; ascites after surgery 16.9%; bile leak and wound infection are 3.6%; There was 1 case of liver failure after surgery, accounting for 1.2%; There were no complications of intra-abdominal bleeding and postoperative mortality.

Postoperative liver failure is the most dangerous complication in hepatectomy. It is closely related to active hepatitis, cirrhosis, residual liver volume, intraoperative blood loss, time to control liver stem, drugs used during and after surgery.

4.4.3. Long-term results after surgery

4.4.3.1. Survival time after surgery

Follow-up time 53 months, average disease-free survival time was 32.58 ± 2.56 months, disease-free survival at 1 year 67.1%, 2 years 56%, 3 years 53.1% . Cumulative relapse rates at 1 year, 2 years, and 3 years were 31.3%, 39.8% and 42.2%, respectively. Overall survival time: 40.68 ± 2.17 months, overall survival at 1 year 88.4%, 2 years 76.3%, 3 years 69.5%.

4.4.3.2. Factors affecting survival time

By univariate analysis, we found that there are 8 factors affecting the disease-free survival time with statistical significance with $p < 0.05$ being the concentration of AFP before surgery; tumor size; u shell; Child - Pugh; Surgical margin ; portal vein thrombosis; disease stage according to BCLC. However, only surgical margin was statistically significant after multivariate analysis.

The results of univariate analysis also showed that there were 8 factors affecting the overall survival time with statistical significance with $p < 0.05$ being tumor size; u shell; lymph node metastasis; Child - Pugh; Surgical margin; portal vein thrombosis; disease stage according to BCLC, Spontaneous rupture. However, only tumor shell, surgical margin, portal vein thrombosis and spontaneous rupture were statistically significant after multivariate analysis.

CONCLUSION

Studying 83 patients with hepatocellular cancer who underwent hepatectomy by Ton That Tung method in combination with Takasaki from February 2017 to July 2021, we draw the following conclusions:

1. Characteristics of pathological lesions related to indications and techniques of hepatectomy by Ton That Tung method combined with Takasaki.

1.1. Characteristics of pathological lesions related to indications

- Average Child-Pugh score 5.36 ± 0.72; Child-Pugh A (91.6%); The mean ALBI score was -2.65 ± 0.438; Esophageal dilatation grade I 11.5%.
- 100% of large hepatectomy had residual liver volume per body weight > 0.8%.
- Alpha-FP > 1000 (28.9%); The average tumor size was 5.23 ± 2.27cm.
- Portal vein thrombosis 3.6%; Stage BCLC A (72.3%), BCLC B (20.5%), BCLC C (7.2%).

1.2. Hepatectomy by Ton That Tung method combined with Takasaki

- Follow 8 steps in which:

+ Liver mobility after controlling Glisson pedicles 7.2%; Active diaphragmatic resection with liver mobility 3.6%;

+ Control of the right Glisson pedicles accounted for 72.3%. There were 68.7% stitches that squeezed the stalk; 74.7% parenchymal removal by Kelly combined with electric knife and ultrasound knife; 85.6% covered the cutting area with surgicel coating.

- Complications encountered in the following steps:

+ Tumor rupture 2.4%; Adrenal tear 10.3% in hepatic mobility

+ Damage to the vena cava 1.2%; peri-pedunculated bleeding 3.6% in extrahepatic Glisson pedicles control.

- Factors that cause difficulty in surgical steps: Infiltrating the stalk after TACE (2.4%); spontaneous rupture (14.5%).

2. Results of hepatectomy by Ton That Tung method combined with Takasaki treatment for hepatocellular cancer

2.1. Results in surgery

- Time to cut parenchyma 37.43 ± 9.94; Surgical time TB 159.70 ± 53.12 minutes; Total blood loss: 247.32 ± 145.145ml;

2.2. Early results

- General complications after surgery (38.6%) in which: pleural effusion (26.5%); ascites (16.9%), liver failure after surgery (1.2%); bile leak (3.6%); wound infection (3.6%); 0% mortality.

- The average farting time was 2.99 ± 0.45 days; The mean postoperative time was 10.82 ± 3.40 (7-25).

2.3. Long-term results after surgery

- Average disease-free survival time 32.58 ± 2.56 months; average overall survival time: 40.68 ± 2.17 months

- Surgical margin > 1cm factors was identified as independent prognostic factors for both overall survival and disease-free survival.

RECOMMENDATION

Studying 83 patients with hepatectomy by Ton That Tung method combined with Takasaki to treat hepatocellular carcinoma, we have the following recommendations: Techniques for temporary selective control of extrahepatic Glisson pedicles and treatment of Glisson pedicles should be combined to minimize surgical complications. Further studies on long-term outcomes and associated factors are needed.