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Original Research Article

Histopathological Evaluation of Gallbladder Specimens Following Cholecystectomy

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Abstract:

Background: Gallbladder diseases are some of the most common hepatobiliary diseases requiring surgical intervention. Histopathologic assessment of the surgically excised specimen is important in making accurate diagnosis and differentiating between various diseases of the gallbladder as well as identifying any unusual premalignant or malignant disorders.

Aim: To purpose is to study the histopathological manifestations of gallbladder conditions on samples from patients who had surgery involving cholecystectomy and understand the demographic and clinical data of the patient and identify the link between the presence of gallstones and their histopathological manifestations.

Methodology: This study observational and descriptive study carried out in the span of a year in the Department of Pathology at ICARE Institute of Medical Sciences and Research and Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India. There were 120 samples of gallbladder specimens after cholecystectomy analyzed through histopathological methods using the hematoxylin and eosin staining technique. Descriptive statistics were used in this study.

Results: Most of the patients (30.0%) were aged between 41 and 50 years. Also, most of the patients were females (71.7%). From the symptoms presented by the patient, right upper abdominal pain (90.0%) was the most frequent symptom among the others. Gallstone has a high incidence rate (80.0%). Chronic calculous cholecystitis (56.7%) is the most prevalent diagnosis histologically. Others include chronic cholecystitis (20.0%) and acute chronic cholecystitis (8.3%). There is epithelial dysplasia and gallbladder carcinoma at a percentage of 1.7% and 2.5% respectively.

Conclusion: The occurrence of chronic calculous cholecystitis was found to happen as a primary histopathological abnormality and had a significant association with gallstones. Histopathological investigation still plays an indispensable role in determining both benign and malignant conditions, thereby helping in their diagnoses and treatment at the right time.

Keywords: Cholecystectomy, Gallbladder Lesions, Histopathology, Chronic Calculous Cholecystitis, Gallstones, Gallbladder Carcinoma.

Introduction

Gallbladder diseases have been observed to play a major role in causing gastrointestinal complications around the world, and they represent some of the major causes of abdominal surgery [1]. Gallstones, chronic cholecystitis, acute cholecystitis, cholesterolosis, and gallbladder carcinoma are examples of diseases that make up a major portion of the disease process in the hepatobiliary system [2].

The removal of tissues from a diseased gallbladder during cholecystectomy has traditionally helped in understanding the underlying causes of various diseases of the gallbladder [3]. The microscopic evaluation of these removed tissues has proved important in determining any underlying disease condition present in the body [4]. Routine microscopic evaluation of tissues from the gallbladder has attained increased importance due to its ability to identify various kinds of inflammatory, hyperplastic, premalignant, and malignant lesions [5].

A number of research studies have shown that chronic calculous cholecystitis has been the most common type of histopathology found, commonly associated with the presence of gallstones [6]. Dysplasia as well as gallbladder cancer cases have also been occasionally found in specimens removed as benign disorders [7]. The current study was therefore conducted to examine the pattern of gallbladder histopathology of specimens taken after

removal of the gallbladder, along with their clinicodemographic profiles and gallstone disease associations [8].

Background of the Study

Gallbladder disease is amongst the most prevalent disease of the hepatobiliary system requiring surgical removal of the gallbladder through a process called cholecystectomy [9]. The pathology of a gallbladder disease can be benign disease such as acute or chronic cholecystitis, premalignant, or gallbladder carcinoma [10]. While clinical investigations and diagnostic tests help to diagnose these lesions, proper assessment is dependent on the use of histopathological tests [11]. Histopathological investigation of cholecystectomy tissue samples has great importance in identifying pathological lesions that remain undetected during clinical investigations. The histopathological characteristics of lesions and associated demographic and clinical parameters could help in accurate diagnosis and treatment of patients.

Histopathological Evaluation of Gallbladder Lesions

Histopathology of gallbladder lesions form's part and parcel of the diagnostic work-up performed after a cholecystectomy procedure [12].

This is because histopathology offers an unequivocal description of the lesion that affects the gallbladder. Although diagnosis of gallbladder disease through clinical assessment, laboratory tests, and imaging studies is possible, confirmation of the lesion in question is only achieved through histopathology [13]. Diagnosis through microscopic examination helps to determine a wide array of lesions that include chronic and acute inflammation of the gallbladder, cholesterolosis, hyperplastic changes, dysplasia, and malignancy [14].

Furthermore, histopathology assists in establishing the connection between gallstone disease and the lesions on the mucosa. Routine histopathology of gallbladder tissues may help to detect lesions that would otherwise have been missed both clinically and using other diagnostic modalities. Premalignant and malignant lesions of the gallbladder can be easily identified through routine histopathological studies [15]. The importance of histopathology lies in its ability to offer information about premalignant or malignant lesions that cannot be diagnosed through other means.

Research Objectives

The research objectives of the study are:

- To describe the spectrum of histopathologic findings in gallbladder specimens after cholecystectomy.
- To determine the demographic characteristics of the patients, including age and gender distribution, and to document the clinical presentations.
- To establish a relationship between the presence of gallstones and histopathologic findings and to identify any incidental premalignant and malignant lesions in the gallbladder specimens.

Methodology

The present study was performed to determine the histopathological diversity among lesions in gallbladder that had been removed surgically in order to find out the frequency of various pathologies including gallbladder carcinoma.

In this regard, an appropriate method was used for collecting and analyzing the clinical as well as histopathological information.

Study Design

This research was done by using a hospital-based observational descriptive study. Findings from histopathological evaluation of gallbladder specimens retrieved after cholecystectomy surgery were evaluated to establish the distribution and clinicopathological features of the different lesions.

Study Area

This study was carried out at the Department of Pathology in collaboration with the Department of General Surgery, ICARE Institute of Medical Sciences & Research & Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India.

Study Duration

This study was carried out for a duration of one year.

Study Participants

The participants of the study included patients undergoing cholecystectomy due to various conditions of the gallbladder and whose gallbladders were submitted for histopathological analysis.

Inclusion Criteria

- Patients regardless of gender 18 years and older.
- Patients undergoing elective or emergency cholecystectomy throughout the study period.
- Gallbladder specimens were found to be intact and preserved appropriately for histopathological evaluation.
- Patients who have all clinical data and other demographic details available in the hospital records.

Exclusion Criteria

- Autolyzed or poorly preserved gallbladder specimens.
- Inadequate tissue samples unsuitable for histopathological evaluation.
- Patients with incomplete clinical details or record.
- Specimens collected from patients who refused consent to use their data for research.

Sample Size

A total of 120 gallbladders collected from patients who had undergone cholecystectomy surgery within the study period were used for analysis. The sample size was calculated based on the average number of cholecystectomies conducted yearly at the study facility as well as availability of the samples within the study period.

Study Procedure

Data collection commenced after receiving clearance from the Institutional Ethics Committee. The demographic information, clinical history, radiological features, and operative reports were collected from the medical records of patients and recorded using a standardized data collection sheet. The gallbladder tissues removed surgically were immediately fixed in 10% neutral buffered formalin solution and sent to the department of pathology. Each gallbladder specimen underwent gross examination, and information regarding the size of specimen, thickness of its walls, mucosal changes, any associated gallstones, polyp, ulcers, or lesions was recorded.

Representative tissue samples were obtained from the fundus, body, neck regions, and all macroscopically diseased tissues. These tissue samples were prepared using conventional histopathological methods involving embedding of tissue samples in paraffin wax, cutting them into slices about 4 to 5 micro meters thick, and staining with H&E.

The stained tissue samples were then studied individually by trained pathologists using a light microscope. The histopathology diagnosis consisted of identifying the type of pathology, which could be classified as follows: chronic cholecystitis, acute cholecystitis, chronic calculous cholecystitis, xanthogranulomatous cholecystitis, cholesterolosis, and adenomatous hyperplasia.

Statistical Analysis

The collected data were processed and analyzed in Microsoft Excel and SPSS v26.0. Descriptive statistics were applied to depict the demographic profile as well as the histopathological results. While categorical variables were reported in frequencies and percentage values, continuous variables were described in terms of mean ± SD.

Relationships among clinicopathological factors and histopathological diagnoses were determined using Chi-square and Fisher's exact tests wherever applicable. $P<0.05$ was taken as a cut-off point for significance. The findings were depicted using tables and charts for proper interpretation.

Results

A total number of 120 gallbladder specimens that were surgically excised in patients undergoing cholecystectomy have been used for the current study. Data analysis was done in reference to demographic features, clinical manifestations, occurrence of gallstones, and histopathology. Insights regarding the diversity of gallbladder diseases and their correlations with various clinicopathological parameters have emerged through the analysis of these data.

Age-wise distribution of cases having undergone cholecystectomy was done in order to determine the commonest age groups affected. Age is a vital demographic factor which may affect both the incidence and course of gallbladder diseases. The age range of patients considered for the research ranged from 18 years to more than 60 years. Frequency distribution of patients in various age groups according to the number and percentage of patients is shown in Table 1 and Figure 1 below.

Table 1: Patients According to Age Group Distribution (n = 120)

Age Group (Years)	Frequency (n)	Percentage (%)
18–30	18	15.0
31–40	32	26.7
41–50	36	30.0
51–60	22	18.3
>60	12	10.0
Total	**120**	**100.0**

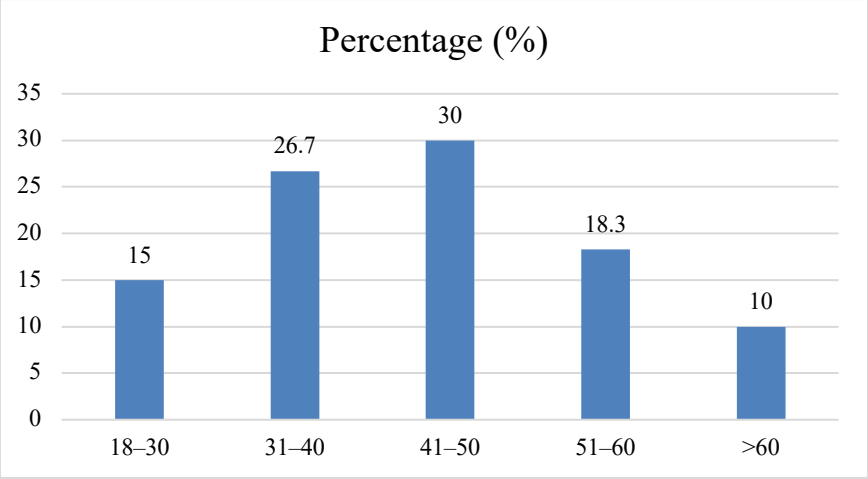

Figure 1: Graphical Representation of Percentage in Distribution of Patients According to Age Group

From Table 1 and Figure 1, one can clearly see that the highest number of patients belonged to the age group of 41-50 years, accounting for 36 (30.0%), while those belonging to the age group of 31-40 years were 32 (26.7%).

The next in line were 51-60 years old, whose number totalled 22 (18.3%), followed by 18 (15.0%) patients who belonged to the age group of 18-30 years. The gender distribution was done to ascertain the frequency of gallbladder conditions among both sexes. It has been established in previous studies that more cases are found in females.

As such, the gender-wise distribution of all cases was undertaken in the current study. The results are presented in Table 2 and Figure 2.

Table 2: Patient Distribution Based on Gender (n = 120)

Gender	Frequency (n)	Percentage (%)
Male	34	28.3
Female	86	71.7
Total	**120**	**100.0**

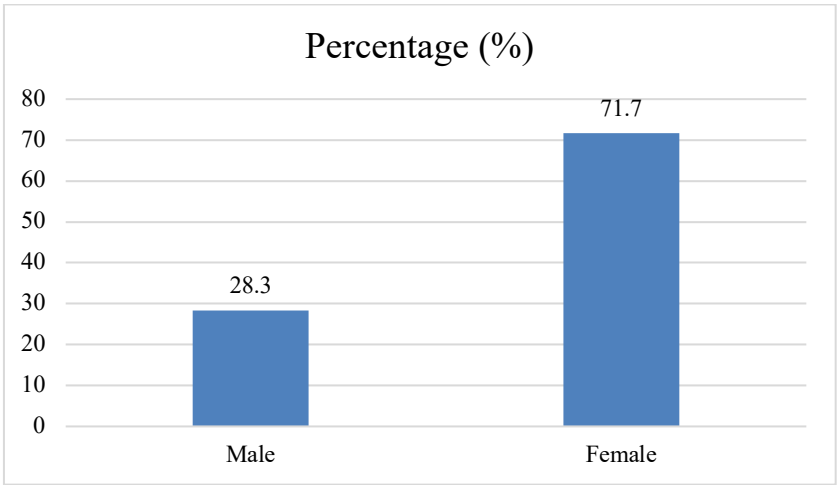

Figure 2: Graphical Representation of Percentage in Distribution of Patients According to Gender

From Table 2 and Figure 2, it is evident that females comprised the larger gender of the research subjects, since 86 (71.7%) cases were female, while 34 cases (28.3%) were male subjects. Thus, there were 2.5:1 female to male ratios. From the above observation, it can be concluded that gallbladder disorders occur more often in females than males. The clinical manifestations of the patients were reviewed to determine the symptoms that are commonly seen in gallbladder diseases. At the time of admission, many patients were experiencing one or more symptoms. Because there were cases where several symptoms occurred in the same patient, there could be more than one symptom for each patient. The results are shown in Table 3 and Figure 3 below.

Table 3: Clinical Presentation of Patients (n = 120)

Clinical Presentation*	Frequency (n)	Percentage (%)
Right upper abdominal pain	108	90.0
Nausea/Vomiting	72	60.0
Dyspepsia	54	45.0
Fever	28	23.3
Jaundice	10	8.3

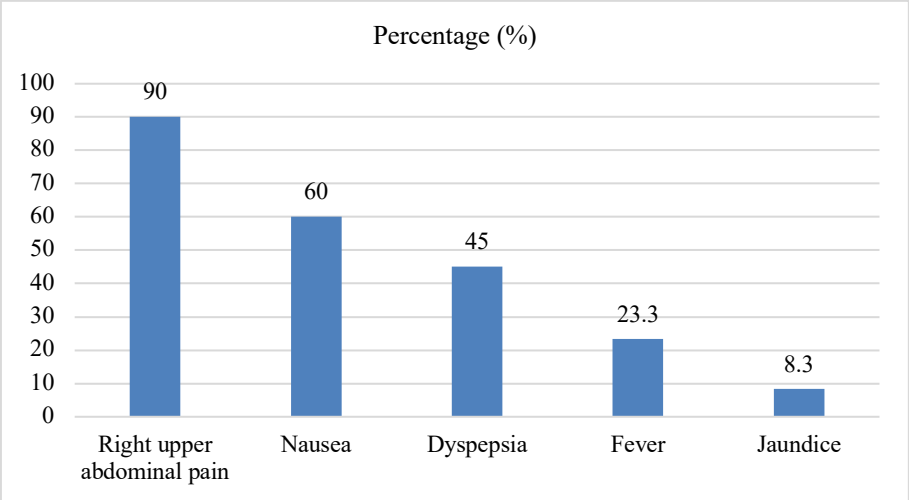

Figure 3: Graphical Representation of Percentage in Clinical Presentation of Patients

Table 3 and Figure 3 show that the most frequent initial presentation was right upper abdominal pain, which occurred in 108 patients (90.0%).

Nausea and vomiting occurred in 72 patients (60.0%) whereas dyspepsia occurred in 54 patients (45.0%). Fever occurred in 28 patients (23.3%) whereas jaundice occurred in the minimum number of 10 patients (8.3%). It is clear from these observations that abdominal pain is the most frequently occurring feature in gallbladder disease. Presence of gallstones in the cholecystectomy specimens was checked due to the fact that gallstone disease is an important etiological agent for gallbladder disease.

Gross analysis of the specimens was conducted to detect the presence of stones. Data on the number of gallstone positive and gallstone negative patients are given in Table 4 and Figure 4.

Table 4: Gallstones Present in Cholecystectomy Specimens (n = 120)

Gallstone Status	Frequency (n)	Percentage (%)
Present	96	80.0
Absent	24	20.0
Total	**120**	**100.0**

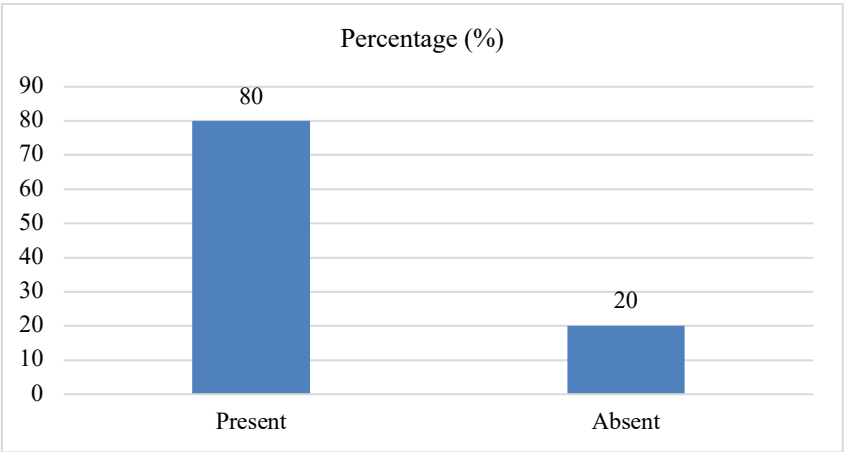

Figure 4: Graphical Presentation of the Presence of Gallstones among Cholecystectomy Gallbladder Specimen

As indicated from Table 4 and Figure 4, the percentage of cases where there were gallstones was 96 cases which accounted for 80.0% while there were 24 cases where there were no gallstones which accounted for 20.0%. From the obtained results, there is a strong relationship between gallbladders and gallstones. A histopathological examination was conducted on all the gallbladder specimens to determine the types of pathological changes. These were inflammatory, hyperplastic, dysplastic, and malignant changes. Histopathological diagnosis still forms the gold standard for the confirmation of gallbladder pathology and incidental pathologies. Distribution of histopathological diagnosis is presented in Table 5 below.

Table 5: Spectrum of Histopathology of Gallbladder Lesions (n = 120)

Histopathological Diagnosis	Frequency (n)	Percentage (%)
Chronic calculous cholecystitis	68	56.7
Chronic cholecystitis	24	20.0
Acute on chronic cholecystitis	10	8.3
Cholesterolosis	6	5.0
Xanthogranulomatous cholecystitis	4	3.3
Adenomatous hyperplasia	3	2.5
Epithelial dysplasia	2	1.7
Gallbladder carcinoma	3	2.5
Total	**120**	**100.0**

As illustrated in Table 5 below, chronic calculous cholecystitis proved to be the most prevalent histopathological finding recorded among the study samples, with 68 cases (56.7%).

Chronic cholecystitis without the presence of gallstones was diagnosed in 24 patients (20.0%) while there were 10 patients (8.3%) that exhibited the condition known as acute on chronic cholecystitis. Cholesterolosis and xanthogranulomatous cholecystitis were found in 6 patients (5.0%) and 4 patients (3.3%), respectively. Three patients were diagnosed with adenomatous hyperplasia, epithelial dysplasia, and gallbladder

The association of gender with the histopathological results was studied in order to find out whether there were any particular gallbladder lesions that affected either males or females in greater numbers. Histopathological diagnosis was classified on the basis of gender. Lesions in males and females are given in Table 6.

Table 6: Distribution of Histopathological Findings in Terms of Gender

Histopathological Diagnosis	Male (n=34)	Female (n=86)	Total
Chronic calculous cholecystitis	18	50	68
Chronic cholecystitis	8	16	24
Acute on chronic cholecystitis	3	7	10
Cholesterolosis	2	4	6
Xanthogranulomatous cholecystitis	1	3	4
Adenomatous hyperplasia	1	2	3
Epithelial dysplasia	0	2	2
Gallbladder carcinoma	1	2	3
Total	**34**	**86**	**120**

Chronic calculous cholecystitis was also more frequent in females, occurring in 50 females versus 18 males. Likewise, there were 16 females and 8 males with chronic cholecystitis.

Cases of acute on chronic cholecystitis included 7 females and 3 males. Epithelial dysplasia was present only in female cases. There were 2 female patients diagnosed with gallbladder carcinoma, whereas one male patient had gallbladder carcinoma. Overall, most histopathological findings were more prevalent in females, considering that gallbladder disease is also more common in women. The association between gallstones and the histopathological diagnosis was studied to determine the effects of the presence of gallstones on different gallbladder lesions.

Comparison was made based on histopathology in specimens with and without gallstones. This helped in determining lesions associated with gallstones. These results are shown in Table 7.

Table 7: Association between Gallstones and Histopathological Diagnosis

Histopathological Diagnosis	With Gallstones (n=96)	Without Gallstones (n=24)
Chronic calculous cholecystitis	68	0
Chronic cholecystitis	14	10
Acute on chronic cholecystitis	8	2
Cholesterolosis	3	3
Xanthogranulomatous cholecystitis	2	2
Adenomatous hyperplasia	0	3
Epithelial dysplasia	0	2
Gallbladder carcinoma	1	2

As depicted in Table 7, all 68 patients of chronic calculous cholecystitis had presence of gallstones. Out of the cases of chronic cholecystitis, 14 cases were seen in gallstone-positive specimens, whereas 10 cases were found in gallstone-negative specimens. Acute on chronic cholecystitis was reported in 8 gallstone-positive specimens and 2 gallstone-negative specimens. However, adenomatous hyperplasia (3 cases) and epithelial dysplasia (2 cases) were found in gallstone-negative specimens. One case of gallbladder carcinoma was seen in a gallstone-positive specimen, while 2 cases were found in gallstone-negative specimens.

Discussion

The present study analyzed the demographic and clinical features of patients having undergone surgery through cholecystectomy and found that gallbladder diseases mostly affected middle-aged people, more specifically people between ages 41-50 years old (30.0%). A pronounced preponderance towards women occurred, which resulted in the female population making up about 71.7% of the entire population studied. Right upper quadrant abdominal pain was the predominant clinical feature (90.0%) with nausea and vomiting being the next one (60.0%). This result is in agreement with the findings from earlier studies by Memon et al. (2011) [16] and Kumbhakar (2016) [17], who similarly noted that the incidence of gallbladder diseases is highest in middle-aged people and females. The preponderance toward females could be explained by hormonal effects on the process of cholesterol and gallstone formation. Abdominal pain was also a key characteristic in previous reports.

Histopathological spectrum wise, the chronic calculous cholecystitis lesion was the most frequent one in the current study, occurring in 56.7% of the cases, while chronic cholecystitis occurred in 20.0% of the cases and acute on chronic cholecystitis occurred in 8.3%.

This is consistent with the observations of Kumar et al. (2015) [18], who have found that chronic inflammatory lesions were the most frequent ones in cholecystectomy patients. The presence of chronic calculous cholecystitis lesions is an outcome of prolonged inflammation caused by the gallstones. Additionally, it is important to point out that histopathological lesions were mostly found in female patients, which is consistent with the results of previous studies. The present study determined the association of gallstones and histopathological features in relation to incidental premalignant and malignant changes. There were 80.0% cases positive for gallstones, and all cases of chronic calculous cholecystitis had gallstones. This indicates the importance of cholelithiasis in gallbladder diseases. Likewise, there was a 1.7% prevalence rate of epithelial dysplasia and 2.5% of cases were of gallbladder cancer. These results are in agreement with those of Shrestha et al. (2010) [19] and Kalita et al. (2013) [20], who suggested that it is crucial to examine gallbladder specimens histopathologically to determine any unexpected premalignant and malignant changes. In addition, the presence of incidental carcinomas and dysplasia in this study emphasizes the need for histopathologic evaluation of all cholecystectomy specimens to ensure early diagnosis.

Conclusion

The present study found that patients who presented gallbladder disorders necessitating surgical removal of the gallbladder mostly comprised middle-aged patients with women being affected more than men. Abdominal right upper quadrant pain was the commonest presenting complaint while gallstones were found to be present in many patients which shows the importance of gallstones in the development of pathological conditions. From the histological findings, the presence of chronic calculous cholecystitis was more prevalent compared to other lesions such as chronic cholecystitis and acute on chronic cholecystitis. The study further found out the presence of some incidental premalignant and malignant lesions, including epithelial dysplasia and gallbladder cancer. These lesions show the importance of routine histopathological examination during post-cholecystectomy diagnosis. In addition, a clear association existed between gallstone disease and chronic inflammatory lesions. This study reveals the importance of routine examination of all cholecystectomy specimens to detect any hidden

pathological findings in order to improve diagnosis and clinical outcomes of the patients.

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