

Conversion rate of laparoscopic cholecystectomy in a sample of patients from Al-Diwaniyah teaching hospital

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Abstract

Back ground:

Laparoscopy became used as a surgical procedure for the removal of gallbladder by Lukichev in 1983 and Muhe in 1985. Those procedures gained little attention and popularity till the well acknowledged laparoscopic cholecystectomy which was performed by the French gynecologist Mouret in 1987.

Aims of the study:

To evaluate the rate of conversion of laparoscopic cholecystectomy into open surgery and its predisposing factors.

Patients and methods: A total number of 1077 patients undergoing elective laparoscopic cholecystectomy were enrolled in the presents study. The sample was composed of 932 females and 145 males and their age ranged from 9-86 years. The study was conducted in Al-Dewaniyiah teaching hospital from January 2015 through December 2015.

Results: The occurrence of disease in female patients was significantly higher than that of male patients ($P<0.001$). The conversion rate of laparoscopic cholecystectomy into open surgery was reported in 13 out of 1077 (1.2%). The conversion was reported only in the following intervals: 30-39 years (0.7%), 40-49 years (1.6%), 50-59 years (3.5%) and 60-69% (0.8%). The rate of conversion was significantly higher in males than females ($P<0.001$).

Conclusions: Conversion rate is acceptable in view with available data. Risks for conversion included: Male gender, advanced age, dense adhesion, diabetes, CBD injury and Cholecystoduodenal fistula.

Introduction

Historical background: The earliest attempts of Laparoscopic procedures were introduced at the beginning of 20th century by Dimitri Ott, Georg Kelling and Hans Christian Jacobeus. Von Ott reported the first attempt for exploration of the uterus of pregnant ladies in the year 1901. Georg Kelling was the first one who did a procedure closely related to what is now familiar as being laparoscopic surgery ⁽¹⁾.

Jacobeus then reported a procedure named "Laparothorakoskopie". Later on, in the following years, early laparoscopic procedures were adopted by European and American centers for the diagnosis of some abdominopelvic lesions ⁽¹⁾.

The popularity of laparoscopic procedures became evident following the introduction of the rod-lens optical system and of the cold light fiber-glass illumination especially in gynecologic procedures. Then afterward the field was extended for the diagnosis of liver pathology and visceral organ trauma ⁽²⁾.

Laparoscopy then became used as a surgical procedure for the removal of gallbladder by Lukichev in 1983 and Muhe in 1985. Those procedures gained little attention and popularity till the well acknowledged laparoscopic cholecystectomy which was performed by the French gynecologist Mouret in 1987. This procedure involved the use of four trocars ⁽²⁾.

Normal anatomy of gallbladder: The gallbladder is situated on the lower surface of the liver (segments IV and V). It is related posteriorly to the 1st and 2nd part of duodenum, and inferiorly to the transverse colon. All of its surface is covered by peritoneum excepted where it adheres with liver. It is divided into fundus, body and neck that terminates with the cystic duct. There a dilatation at the area between neck and cystic duct known as infundibulum. Cystic duct terminates by joining the common hepatic duct to form the common bile duct. The width of the cystic duct is 1-3 mm, and its length is variable which is frequentl 3-4 cm. The lining mucosa of the cystic duct has folds with spiral orientation known as the valve of Heister ^(3, 4).

Anatomy of the bile duct: The union of the right and left hepatic ducts gives rise to the common hepatic duct. This union usually occurs at variable distance. Calot's triangle refers to the area bounded by cystic duct inferiorly, common hepatic artery medially and superior border of the cystic artery, this triangle is important from surgical point of view as it contains the cystic artery and lymph node ^(3, 4).

The blood supply to the bile ducts is complex and received from the gastroduodenal, hepatic and cystic arteries, as well as the coeliac and superior mesenteric vessels ^(3, 5).

Variations and anomalies of anatomy: Gallbladder

1. Absent: The gallbladder may rarely be absent or rudimentary
2. Location: Left-sided intrahepatic gallbladders
3. Number: double and triple gallbladders have also been reported.
4. Shape: The body may be divided completely or partially by a septum. Partial separation of the fundus from the body seen at surgery or during pre-operative imaging is known as a Phrygian cap. Complete investment of gallbladder with peritoneum can predispose to torsion ⁽⁶⁾.

Pathology: Gallstones. The most frequent billiray diseases is related to gallstones. Most of the cases are asymptomatic. one to two percent of those asymptomatic patients are prone to develop symptoms annually which usually make surgical operation mandatory making cholecystectomy one of the most common surgical procedures that are done by general surgeons globally ⁽⁷⁾.

There are three types of gallstones: cholesterol, pigment (brown/black) or mixed stones. There is significant variation in the proportion of gallstones according to types worldwide.. Pigment stones are those stones that contain less than 30% cholesterol. Pigment stones could be black (associated with haemolysis) or brown (related to bile stasis and infected bile) ^(8, 9).

Clinical presentation: Usually asymptomatic that is discovered incidentally by routine imaging. Symptoms may be in the form of right upper quadrant pain associated with dyspeptic symptoms. The presentation may be in the form of acute cholecystitis , acute on chronic or chronic ⁽¹⁰⁾.

Laparoscopic cholecystectomy

The preparation is essentially similar to that of open cholecystectomy. It is the technique of choice in most patients with gallstone. The most important step is identification of Calot's triangle. The following is done:

Placing the patient in supine position.

Induction of general anesthesia.

Skin preparation.

Co2 is used to establish pneumoperitoneum by Verres needle prior to placing the initial trocher or by open method.

Initial port used as a camera port.

Other ports are: subxiphoid area, right subcostal area, anterior axillary.

The patient is placed in a reverse Trendelburg position slightly rotated to the left. This make the gallbladder fundus exposed.

Then the gallbladder is retracted toward the diaphragm.

To expose the Calot's triangle, the neck of the gallbladder is pulled toward the RIF.

Dissection of the peritoneum posteriorly and on the anteriorly to make the area widely open.

Then identification of cystic duct and artery.

Then the gallbladder is separated from the liver bed for around 2 cm in order to identify the anatomy with certainty.

The cystic duct and artery are clipped and divided.

The gall bladder is then removed from the gall bladder bed by cautery dissection and once free removed via the umbilicus ⁽¹¹⁾.

Aims of the study:

To evaluate the rate of conversion of laparoscopic cholecystectomy into open surgery and its predisposing factors.

Patients and methods: A total number of 1077 patients undergoing elective laparoscopic cholecystectomy were enrolled in the presents study. The sample was composed of 932 females and 145 males and their age ranged from 9-86 years. The study was conducted in Al-Dewaniyah teaching hospital from January 2015 through December 2015.

Type of study was designed to be an observational cross sectional study. Every patient received the same routine preoperative preparations including full history regarding age, gender, occupation, present illness and past medical and surgical history and others which are shown in the case sheet in appendix I; Proper general, systemic and local abdominal examination followed by biochemical, hematologic and imaging investigation techniques. Patients were categorized according to 10 years intervals and according to gender.

Patient follows up: Patients were followed up during and day 0 post operative day for any complication. In cases ended up with conversion, the follow up was extended for variable time depending on required health care support.

Pilot study: A pilot study was conducted to know the adequate number of cases to be enrolled in the study based on admission rate for elective cholecystectomy, and to know limitations and obstacles that may interfere with the fulfillment of the aim of the current study.

Statistical analysis: Data were summarized, presented and analyzed using two software programs. These were the statistical package for social sciences (SPSS, Chicago version 20) and Microsoft Office Excel 2010. Numeric variables were expressed as mean \pm SD, while nominal variables were expressed as number and percentage. Chi-square test was used to study association between any two nominal variables. P-value was considered significant when it was equal or less than 0.05.

Results:

Total number of cases of laparoscopic cholecystectomy was 1077 from January 2015 through December 2015. Out of the total number of cases, 932 were female accounting for 87% while the number of male patients was 145 (13%). The male to female ratio was 1:6.43. This is shown in figure 1. The occurrence of disease in female patients was significantly higher than that of male patients (P<0.001).

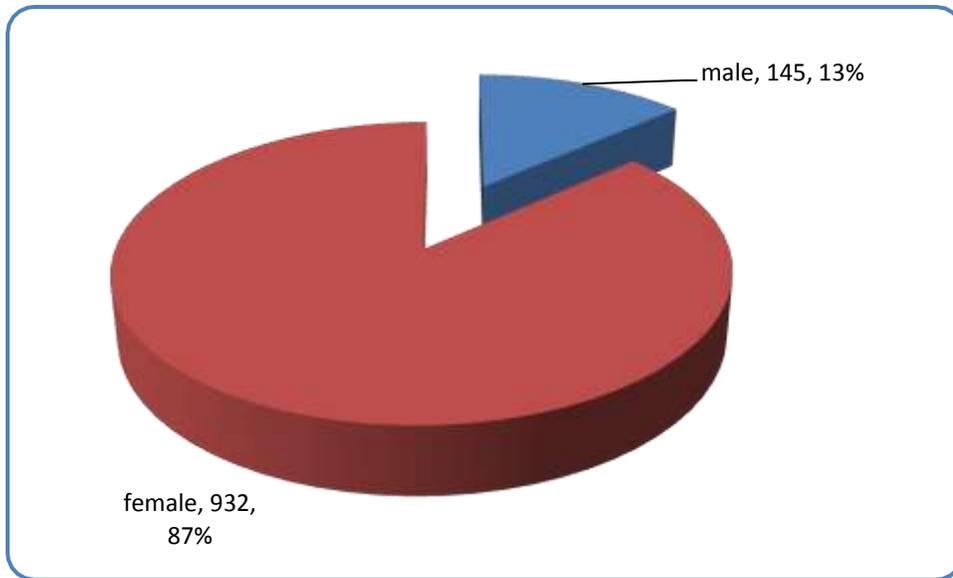


Figure 1: Pie chart showing the classification of cases according to gender

The distribution of cases according to age intervals is shown in table 1 and figure 2. The results were as follows:

Table 1: Distribution of cases according to 10 years age intervals

Age interval	N	%
<10 years	1	0.1
10-19 years	13	1.2
20-29 years	207	19.2
30-39 years	290	26.9
40-49 years	252	23.4
50-59 years	170	15.8
60-69 years	118	11.0
70-79 years	24	2.2
80-89 years	2	0.2
Total	1077	100.0

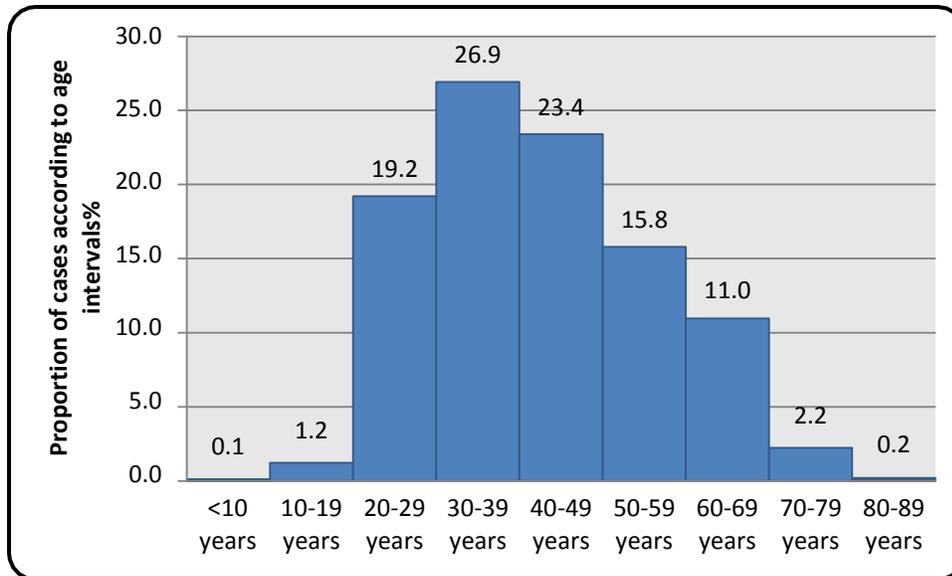


Figure 2: Distribution of cases according to 10 years age intervals

The conversion rate of laparoscopic cholecystectomy into open surgery was reported in 13 out of 1077 (1.2%), as shown in figure 3.

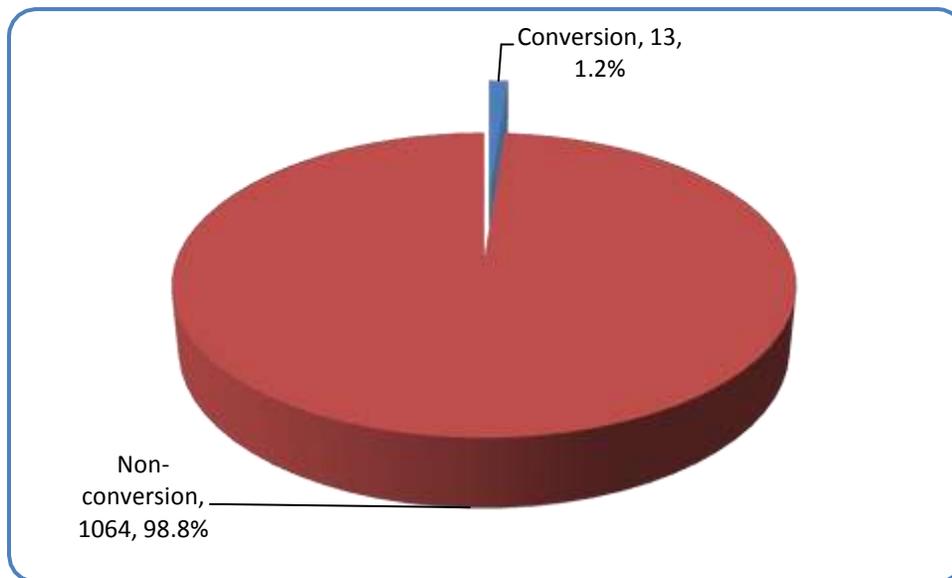
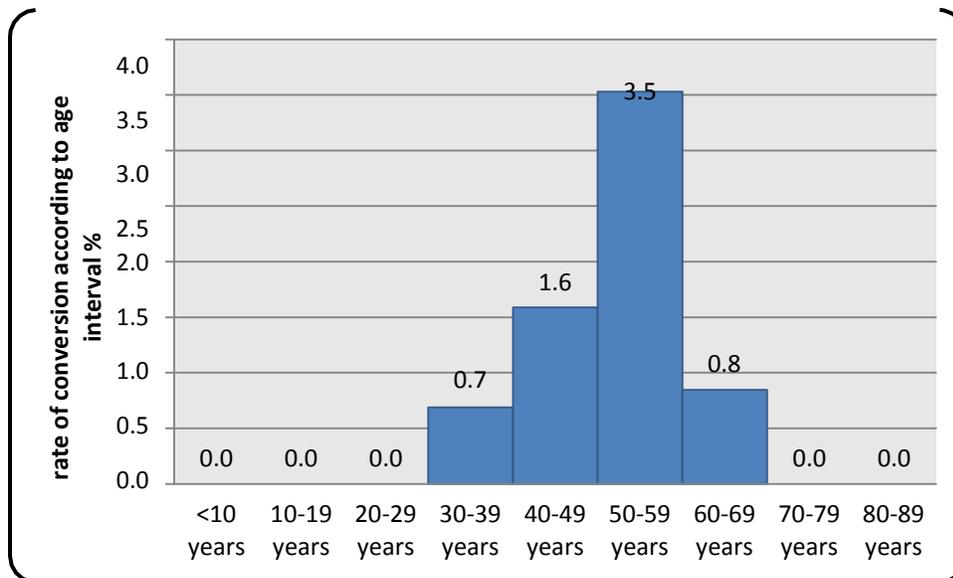


Figure 3: Pie chart showing the conversion rate.

The conversion rate according to age interval is shown in table 2 and figure 4. The conversion was reported only in the following intervals: 30-39 years (0.7%), 40-49 years (1.6%), 50-59 years (3.5%) and 60-69% (0.8%).

Table 2: Conversion rate according to age intervals

Age interval	number of patients	number of conversion	%
<10 years	1	0	0.0
10-19 years	13	0	0.0
20-29 years	207	0	0.0
30-39 years	290	2	0.7
40-49 years	252	4	1.6
50-59 years	170	6	3.5
60-69 years	118	1	0.8
70-79 years	24	0	0.0
80-89 years	2	0	0.0
Total	1077	13	1.2

**Figure 4:** Histogram showing the rate of conversion according to age

The conversion rate according to gender is shown in table 3. The rate of conversion was significantly higher in males ($P < 0.001$). **Table 3:** The conversion rate according to gender

Gender	Number of patients	Number of conversion	%
Male	145	7	4.8
Female	932	6	0.6

The sensitivity of ultrasound in detecting signs of chronic inflammation in comparison with operative finding is shown in table 4. The sensitivity was 91.7 % while specificity was 100.0 %. Positive predicative value was 100% while negative predicative value was 99.6%.

Table 4: Sensitivity of ultrasound in detecting signs of chronic inflammation

Sensitivity	91.7 %
Specificity	100.0 %
PPV	100.0 %
NPP	99.6 %

Figure 5 showed the rate of false negative by ultrasound in detecting signs of chronic inflammation.

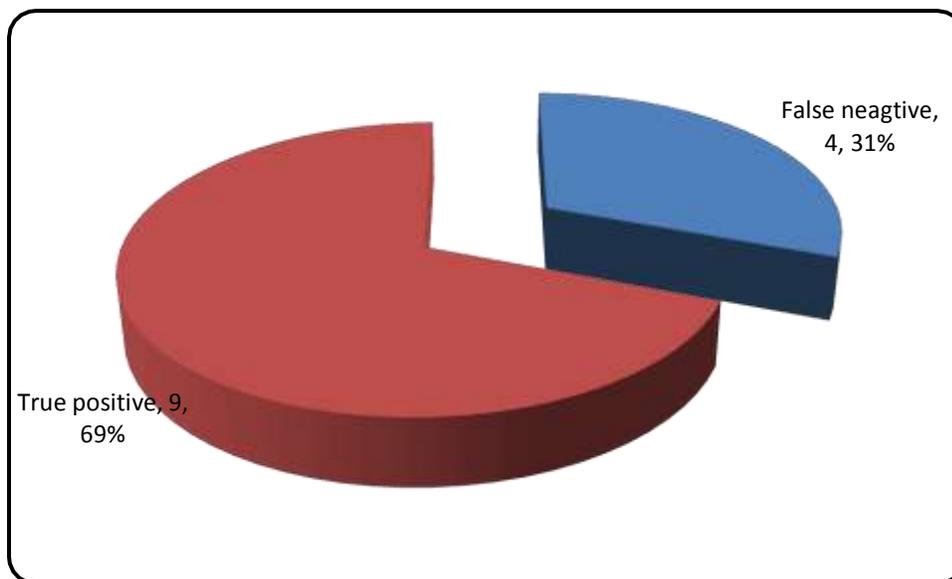


Figure 5: Rate of false negative in ultrasound

Surgical outcome is summarized in table 5. **Table 5:** Summary of surgical outcome

Outcome	N	%
Conversion	13	1.2
CBD injury	1	0.1
Dens adhesion and loss of anatomy	9	0.8
Cholecystoduodenal fistula	1	0.1
Acute on chronic setting	4	0.4
Mortality	0	0.0

Discussion

Rate of Laparoscopic cholecystectomy: The present study showed that the number of cases during 2015 was 1077 and this number is relatively acceptable with the advancing surgical approaches in treating biliary disorders challenged by the limited resources and the extreme shortage in the number of adequately equipped surgical theater room for the laparoscopy in Al-Dewaniyah teaching hospital. And this number is strikingly higher than that which was reported by Witwit R.J. and Jassim A.K. in 2014⁽¹²⁾, who studied the conversion rate on only 221 patients subjected to laparoscopic cholecystectomy. Similarly the number expressed by the current study is far more than that described by Al-Saffar *et. al*, in 2010⁽¹³⁾; this study was conducted in Surgical Unit, Al-Sadur Teaching Hospital, Al-Najaf city and included only 350 patients only, taking into consideration that the study spanned a period of time exceeding two years. This relatively high number of cases reflects the need for more extension in the infrastructure for the health center to be developed toward some independency and in fact this steep has seen light in 2016 during which the laparoscopic unit has been established in Al-Dewaniyah teaching hospital and the last few years reported a substantially increased number of authorized surgeons in this field. It is important to mention that this relatively enormous number of cases was accomplished by 10 authorized surgeons and the number is expected to rise in the incoming years.

Demographic characteristic of patients enrolled in the current study: Mean age of the patients was 42.58 ± 5.63 years and the age range was 9 years up to 86 years. The mean age reported in the present study is in accordance with what is published in most literatures for presentation of gallbladder disease, as recorded by Nakeeb *et. al.*, in 2002⁽¹⁴⁾, and Mahafza A.M. and Daradkeb in 2009⁽¹⁵⁾.

The male to female ratio in the present study was 1:6.43. This high rate of disease among female is well established in most literatures, as reported for example by Nakeeb *et. al.*, in 2002⁽¹⁴⁾, and Mahafza A.M. and Daradkeb in 2009⁽¹⁵⁾.

Conversion rate to open cholecystectomy: The conversion rate calculated by the present study was 1.2%. This rate was lower than what was reported by Witwit R.J. and Jassim A.K. in 2014⁽¹²⁾, an overall conversion rate of 2.7%, and also lower than that which was reported Al-Saffar *et. al*, in 2010⁽¹³⁾, an overall conversion rate of 2%. On the other hand the rate reported by Memon M.R. *et. al.*, 2011⁽¹⁶⁾, who stated that the rate was 0.65%, was much lower than the rate

of conversion reported by the present study. A conversion rate of 1.88% has been reported in a series of 1220 patients from a single center. Vagenas K, Karacanakos SN 2006⁽¹⁷⁾.

The apparently lower rate of conversion in the present study in comparison with studies conducted in Baghdad and Najaf might be explained by the adoption of certain selection criteria by most of surgeons. These selection criteria include non-acute presentation, young patients, no previous history of upper abdominal surgery or intervention and no ultrasound finding suggestive of anticipated complications. From another point of view one can mention a sample size effect on the conversion rate since the present study included a much higher number of cases in comparison to the above mentioned studies. It is well known that the higher the sample size the better is the power of statistical strength.

Risk factors for conversion: The conversion rate in male patients was significantly higher than that of female patients ($P < 0.001$). Expectedly male gender might be considered as a risk factor for conversion. This high rate of conversion in male patients was confirmed in several other studies, Sakpal S.V. et. al., in 2010⁽¹⁸⁾, H. J. J. van der s teeg *et al* , in 2011⁽¹⁹⁾, U Jethwani *et. al.*, in 2013⁽²⁰⁾ and R.J. and Jassim A.K. in 2014⁽¹²⁾. The exact explanation is not fully known but it may be due to the fact that, men are more tolerant to pain than women or reluctant or too busy to seek medical advice as stated by Sultan A.M. in 2013⁽²¹⁾.

The mean age of patients ended up with conversion was 51.31 ± 5.12 years which was significantly higher than the overall mean age of patients included in the present study. Advanced age was reported to be a risk factor for conversion by several authors, Tayab M et al in 2005⁽²³⁾, Al-Salamah S.M. in 2005⁽²²⁾ and Sakpal S.V. et. al., in 2010⁽¹⁸⁾. Advanced age might be associated with late presentation and co morbidity.

Dense adhesion and loss of anatomy is an important risk factor for conversion as reported in the present study and this was in accordance with several other authors Tayab M et al in 2005⁽²³⁾, Al-Salamah S.M. in 2005 and⁽²²⁾ Sakpal S.V. et. al., in 2010⁽¹⁸⁾. It is obvious that adhesion and loss of anatomy is a hallmark obstacle for laparoscopic procedures.

Diabetes was reported in 3 patients who ended up with conversion, nevertheless there was no significant statistical association. Diabetes has reported by some authors to be a risk factor for conversion, Tayab M et al in 2005⁽²³⁾, Al-Salamah S.M. in 2005⁽²²⁾ and Sakpal S.V. et. al., in 2010⁽¹⁸⁾.

The lack of significant association between diabetes and conversion in the present study might be due to a low overall conversion rate since only 13 patients underwent conversion and only 3 of them were diabetic.

Common bile duct injury was a cause of conversion in one of patients enrolled in the present and Cholecystoduodenal fistula was reported in another patient.

Conclusions

1. Conversion rate is acceptable in view with available data.
2. Risks for conversion included: Male gender, advanced age, dense adhesion, diabetes, CBD injury and biliary enteric fistula.

Recommendation

1. Conducting a large multi-centric study to estimate the exact rate of conversion.
2. Taking into consideration the thorough workup of patients with advanced age to avoid subsequent conversion.
3. A symptomatic gallstone diagnosed in elderly diabetic patients should be managed surgically as early as possible.

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