Factors Affecting Early and Late Extubation in Liver Transplant Patients

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Abstract

Background: Tracheal extubation is a critical stage and expensive practice in patients undergoing major operations such as liver transplantation. This study was carried out to determine factors affecting extubation time in liver transplant patients.

Methods: From 2003 to 2006, all patients undergoing liver transplantation in Nemazee Hospital affiliated to Shiraz University of Medical Sciences were enrolled. All patients were anesthetized identically and the time of extubation was based on standard protocol of extubation. The patients were divided into two groups of extubated after admission in less (Group 1) and more than (Group 2) four hours. The effect of 19 pre and post operative factors on extubation was also evaluated.

Results: Two hundred patients (Group 1=121; Group 2=79) entered the study. A significant correlation was noticed for bleeding during operation, abnormal blood pressure more than 30 minutes at the end of surgery and duration of operation. A rise in extubation time was observed when duration of surgery increased. In ICU, 37 patients needed reintubation among them 23 were in Group 2 and 14 in Group 1. The most common causes of reintubation were insufficient oxygenation, repeated laparotomy and decrease in consciousness level. The mean days of ICU staying in early and late extubation groups were 4.16 and 6.04 days (p=0.001).

Conclusion: It seems that duration of surgery, bleeding during operation and an abnormal blood pressure may delay the time of extubation. An early extubation may result into a decrease in duration of ICU admission too.

Keywords: Early extubation; Liver transplantation; Bleeding; Blood pressure

Introduction

Since the performance of the first successful human liver transplantation (LT) in 1963, this procedure was accepted as a therapeutic measure in acute and chronic end-stage liver diseases. Various criteria were described for successful extubation after LT to reduce the cost and to improve the resource utilization by eliminating unnecessary medical interventions and care. Reducing postoperative mechanical ventilation in patients undergoing LT may have clinical and organizational advantages.

Small single-institutional studies performed prior to the introduction of organ allocation using the Model for End-Stage Liver Disease (MELD) suggest that early airway extubation of liver transplant recipients is a safe practice. For selected patients, early extubation resulted in a decreased length of stay in the intensive care unit (ICU) and the hospital, which in turn lowered the costs of the health care and led to a more efficient use of resources. In addition, it was shown that immediate tracheal extubation is well tolerated in selected liver transplant recipients. From a clinical view point, immediate extubation after liver transplantation means a reduction in postoperative intensive care and from a patient perspective.
Extubation in liver transplant patients

Perspective, early extubation seems humanitarian. Meanwhile, some authors on fast tracking in clinical LT have shown that this technique merits increasing interest in many transplant centers worldwide. Proper tracheal extubation has a critical role in LT and has a good predictive value to identify those patients who suffer from a primary respiratory failure. Immediate tracheal extubation in the operating room following LT has been proposed in the pediatric population, and in adults living-related liver transplant recipients. So, this study was performed to determine factors affecting early and late extubation in liver transplant patients to decrease the related expenses.

Materials and Methods

Among 252 patients who underwent LT from 2003 to 2006 in Nemazee Hospital; the only LT center in Iran affiliated to Shiraz University of Medical Sciences in Shiraz, Southern Iran, 200 patients entered our study. The excluding criteria were age less than 15 years, severe pulmonary disease before operation and primary non-functional grafts. So 52 patients were excluded from the study.

Patients were divided into two groups of early (less than 4 hours: Group 1) and late (more than 4 hours: Group 2) extubation including 121 and 79 patients respectively. The patients were anesthetized in a similar method including atracurium (0.8 mg/kg), morphine (0.15 mg/kg), sodium thiopental (3-6 mg/kg) and midazolam (0.2 mg/kg) for induction and atracurium, isoflurane and O2/air for the maintenance.

A Piggy back method was applied for all patients. Wean by synchronized intermittent mechanical and pressure support in ICU as tolerated within the following parameters was done: maintain pH>7.35, PaCO2<55, PaO2>80, respiratory rate <25, minute ventilation<15.

The criteria for extubation of patients based on the judgment of the anesthesiologist of the group were when patients were conscious, had gag reflex, tidal volume more than 6 ml/kg, respiratory rate less than 20 minutes, normal PCO2, normal body temperature, stable hemodynamic condition, stable blood pressure and heart rate, rhythm not requiring pharmacologic support or monitoring, no requirement to intravenous administration of antihypertensives, being afebrile, maintaining a Spo2>90% with Fio2<50%, no ongoing bleeding or worsening coagulopathy and extubated.

The demographic information, duration of operation, amount of bleeding, blood pressure, pulse rate, positive inspiratory pressure, clamping time, the amount of consumed crystalloid fluid, blood bags and albumin, intracardiac and divertic medications, MELD score, urinary output during operation, Pa O2 and Pa CO2, 30 minutes before operation termination, sodium and potassium, consumed bicarbonate and atracurium, patient outcome, duration of hospitalization, blood pressure and any reintubation report were provided from the patient’s file. The study was approved in university Ethics Committee and a written consent was provided from each patient. SPSS software (Version 11.5, Chicago, IL, USA) was used for statistical analysis by student t test, logistic and linear tests. A p value less than 0.05 was considered significant.

Results

From the 200 LT patients, 129 were male and 71 female. The mean age was 37.5 years (Range=15-61 years), and the mean weight was 67.5 kg (Range=28-103 kg). Forty five patients (22.5%) had HBV related cirrhosis; 4 (2%) HCV related cirrhosis, 10 (5%) ethanol cirrhosis, 47 (23.5%) cryptogenic cirrhosis, 26 (13%) autoimmune hepatitis and 32 (16%) primary sclerosing cholangitis. In 36 (18%) patients, other underlying liver diseases were mentioned. The portal vein, vena cava mean clamping time was 66.2 min (Range=40-111 min). The mean operation time was 422.4 min (Range=280-660 min).

A significant correlation was noticed for bleeding during operation (p<0.001), abnormal blood pressure more than 30 minutes at the end of surgery (p=0.003) and duration of operation (p=0.04) (Table 1). An increase in extubation time was observed when duration of surgery increased. In ICU, 37 patients needed reintubation among them, 23 were in Group 2 and 14 in Group 1. The mean days of ICU staying in early and late extubation groups were 4.16 and 6.04 days (p=0.001). There was not a significant correlation between hospitalization and extubation time (19.76 days in early and 21.9 days in late extubation groups; p=0.14).

The most common causes of reintubation were insufficient oxygenation, repeated laparotomy and decrease in consciousness level.
Discussion

Increase in survival rates after LT in patients with end-stage liver disease are possible because of the advanced understanding of the pathophysiology of liver disease, the improvement in multiorgan procurement and preservation methods, and the presence of safe and potent immunosuppressive medication. Of course, standardization of surgical procedures and promotions in anaesthetic management are significant important factors to this development. The up-to-date concept of improving patient outcome following OLT includes a fast track approach in selected patient populations, which may shorten ICU and/or hospital stay and decline the costs. In particular, immediate postoperative extubation was demonstrated as the best tool to improve clinical results and decrease the drain on financial resources. Studies on fast tracking protocols demonstrated that prolonged mechanical ventilation after surgery is no more justified in most of patients.17

The most common causes of LT in our center were cryptogenic liver diseases and hepatitis B. Our large sample size is identical to the study of Bincofiore et al.3 who studied early extubation during a five years period and reported reintubation in 13.2% of cases. Among our early extubation group, 11.5% underwent reintubation due to insufficient arterial blood oxygen saturation and surgical problems. In our study, the difference is due to exclusion of patients with primary non-functional graft leading to elongation of extubation time. In our study, the amount of bleeding during operation, duration of surgery and abnormal blood pressure showed a significant difference between the two groups which may be due to the delay in extubation time of the second group.

MELD score is an important factor in patients before undergoing LT. Biuncoriore et al.3 reported that a
score of less than 11 can be a predictor of successful extubation after LT whereas in our center, patients with score of less than 15 rarely underwent LT and no significant difference was noticed between the two groups. In our study, the hospitalization time of Group 1 in ICU was two days less than Group 2, resulting into a save up of 200 days of occupying ICU beds. Findlay et al. \(^{18}\) did not show any correlation between decrease in extubation time and decline in ICU hospitalization time, but Mandell et al. \(^{2}\) demonstrated that post operative extubation would result into a decrease in ICU hospitalization time. Our study did not show any significant difference between early and late extubation in relation to hospitalization time. It may be due to the long distance between the hospital and the patient’s residential in other cities of the country while our center is the only one in Iran. So, patients would be discharged when they are stable and are in a good condition.

The results of our study showed that in patients undergoing LT, bleeding during surgery, operation period, and abnormal blood pressure can delay extubation time while an early extubation may decrease the ICU time.

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Conflict of interest: None declared.

References

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