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Assessment of Post-Anaesthesia Recovery Using Modified Aldrete Score and Fast-Track Criteria: A Comparative Study

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Abstract

Background: Assessment of postoperative recovery is an important component of perioperative patient care following general anaesthesia. Standardized recovery scoring systems are used in the post-anaesthesia care unit (PACU) to determine patient readiness for discharge. The Modified Aldrete Score is widely used for evaluating recovery, while fast-track criteria have been introduced to identify patients suitable for early discharge and improved perioperative efficiency.

Aim: To compare the Modified Aldrete Score and fast-track criteria in determining postoperative recovery following general anaesthesia.

Materials and Methods: This prospective comparative study was conducted in the Department of Anaesthesia at a tertiary care teaching hospital attached to MAHER University, Kanchipuram. A total of 90 patients undergoing elective surgical procedures under general anaesthesia were included in the study. Postoperative recovery was assessed in the PACU using both the Modified Aldrete Score and fast-track criteria. The time required to achieve a Modified Aldrete Score of ≥9 and the time required to fulfill fast-track recovery criteria were recorded and compared. Statistical analysis was performed using appropriate tests, and a p value less than 0.05 was considered statistically significant.

Results: The mean recovery time according to fast-track criteria was 14.2 ± 3.8 minutes, whereas patients required 18.6 ± 4.5 minutes to achieve a Modified Aldrete Score of ≥9. Patients achieved recovery significantly earlier when assessed using fast-track criteria, and the difference was statistically significant ($p < 0.001$). These findings indicate that fast-track criteria allow earlier identification of recovery in patients following general anaesthesia.

Conclusion: Both the Modified Aldrete Score and fast-track criteria are reliable methods for assessing postoperative recovery. However, fast-track criteria allow earlier detection of recovery and may help reduce PACU stay while maintaining patient safety.

Keywords: Modified Aldrete Score, fast-track criteria, postoperative recovery, general anaesthesia, post anaesthesia care unit.

Introduction

Post anaesthesia recovery is a crucial period in perioperative patient management, as it is when the physiological functions that were removed with the use of anaesthetic agents must be restored. Before transferring patients from the post anaesthesia care unit (PACU) to the ward or discharging after ambulatory procedures, a careful assessment of recovery is vital in protecting patient safety. Inadequate assessment in the postoperative stage could lead to airway compromise, respiratory depression, hemodynamic changes or

poor neurological resolution. Standardised tools for assessing recovery remain widely used in clinical practice to provide an objective measure of recovery from general anaesthesia [1].
Different scoring systems based on clinical evidence have been proposed for the evaluation of post anaesthesia recovery; among such systems, Modified Aldrete Score is widely used in clinical practice. The Modified Aldrete Score assesses five important parameters such as activity, respiration, circulation, consciousness, as well as oxygen saturation. The parameters are judged alone with the total score assisting to decide if a patient is well enough for discharge from the PACU. This easily applicable scoring system is universally accepted due to its simplicity, reproducibility and ease of use in different surgical setups [2].

Improved anaesthetic techniques and greater numbers of day case procedures mean that there is now an increasing emphasis on rapid recovery and early discharge in modern anaesthetic practice. This, in turn, has led to alternative assessment tools like fast track criteria to identify patients who can safely skip out on the lengthy recovery period in the PACU and be transferred directly to step down recovery areas. The fast track criteria assess parameters, including consciousness level, ambulation status, hemodynamic stability, pain control and absence of significant postoperative nausea and vomiting with the intention to allow clinicians to identify patients that can profit from early recovery and discharge [3].

Fast track recovery protocols have led to considerable interest for their possible advantages, including shortened PACU stay, improvement of operating room efficiency and patient satisfaction. The purpose of these protocols is to achieve rapid recovery with maximum safety. Differences do exist between the traditional recovery scoring systems like Modified Aldrete Score and more recently, newer fast track criteria for signalling readiness to discharge patients after general anaesthesia. [4–6] A precise assessment of the surgical recovery is especially relevant for surgeries with shorter duration and in patients who receive ambulatory treatment, as they are expected to be ready for discharge earlier. Using an appropriate recovery assessment tool can also prevent premature discharge while again avoiding unnecessary delays in transfer from a post-anesthesia care unit or recovery room [7].

Both the Modified Aldrete Score and fast track criteria are commonly used in practice but have never been compared head-to-head, nor has either been evaluated against recovery post-general anaesthesia within different clinical settings. Knowledge of the merits and demerits of these assessment tools might contribute to optimizing recovery protocols, thus minimizing adverse events [8,9]. Hence, this study was conducted to compare the Modified Aldrete Score with fast track criteria to assess postoperative recovery of patients undergoing surgeries under general anaesthesia.

Materials & Methods

Study Design

This was a prospective comparative observational study with the objective of treatment comparison between Modified Aldrete Score (MAS) and Fast-Track Criteria (FTC) to see how effective were these tools in identifying postoperative recovery and readiness for discharge by comparing MAS & FTC amongst patients undergoing surgery under general anaesthesia.

Study Setting

The study was conducted after obtaining Institutional Ethics Committee clearance in the Department of Anaesthesiology, Meenakshi Medical College Hospital and Research Institute, Kanchipuram, Tamil Nadu a tertiary care teaching hospital for 12 months.
Study Population: Inclusion criteria included adult patients undergoing elective surgical procedures under general anaesthesia [1]. Sample Size: 90 patients were included using consecutive enrollment after written informed consent.
Inclusion Criteria: Patients aged 18–60 years, classified as American Society of Anesthesiologists (ASA)

Physical Status I or II, scheduled for elective surgery under general anaesthesia, able to provide written informed consent.

Exclusion Criteria: Patients with ASA Physical Status III or higher, undergoing emergency surgical procedures, having neurological or psychiatric disorders affecting consciousness or postoperative assessment, requiring postoperative mechanical ventilation, admitted to the intensive care unit (ICU) following surgery, unwilling or unable to cooperate with the study, or declining to provide informed consent.

Preoperative Assessment: A meticulous pre-anaesthetic evaluation, encompassing extensive medical history, thorough physical examination, airway assessment and standard laboratory investigations was carried out in all patients. Demographic data: age, sex, body mass index (BMI), ASA physical status and comorbidities were documented.

Anaesthetic Management: All patients received standard general anaesthesia according to institutional protocols. Standard intraoperative monitoring included electrocardiography (ECG), non-invasive blood pressure (NIBP), pulse oximetry (SpO_2), respiratory rate, and end-tidal carbon dioxide ($EtCO_2$). Anaesthetic induction, maintenance, muscle relaxation, intraoperative fluid management, and reversal of neuromuscular blockade were performed in accordance with standard institutional practices.

Postoperative Recovery Assessment: After completion of surgery and reversal of anaesthesia, all patients were transferred to the Post Anaesthesia Care Unit (PACU) for postoperative monitoring. Recovery was assessed simultaneously using two validated scoring systems: the Modified Aldrete Score (MAS) and the Fast-Track Criteria (FTC). The Modified Aldrete Score evaluated activity, respiration, circulation, consciousness, and oxygen saturation, with each parameter scored from 0 to 2, giving a maximum total score of 10. Patients achieving a score of ≥9 were considered fit for discharge from the PACU. The Fast-Track Criteria assessed the level of consciousness, physical activity, haemodynamic stability, respiratory status, pain control, and the presence of postoperative nausea and vomiting. Patients attaining the predetermined Fast-Track score were considered eligible for bypassing prolonged PACU stay or for early discharge.

Data Collection

Recovery assessments were performed at predetermined postoperative intervals until patients fulfilled the discharge criteria of the respective recovery scoring systems. The variables recorded included the time to achieve a Modified Aldrete Score (MAS) ≥9, time to satisfy the Fast-Track Criteria (FTC), heart rate, blood pressure, oxygen saturation (SpO_2), pain score, incidence of postoperative nausea and vomiting (PONV), and any recovery-related complications observed during the postoperative period.

Statistical Analysis

Data were entered in Microsoft Excel and analysed with IBM SPSS Statistics version _. Continuous variables were reported as mean ± SD, while categorical variables expressed as frequency and percentage. The data was then analyzed for comparison between the Modified Aldrete Score and Fast-Track Criteria using appropriate statistical tests (Independent t-test, chi-square test, Mann–Whitney U test where applicable). The Kappa statistic was used to evaluate agreement between the two scoring systems. P-value <0.05 was regarded statistically significant.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of MAHER University before the initiation of the study. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants before enrolment after explaining the purpose and procedures of the study. Participant confidentiality and anonymity were maintained throughout the study, and all collected information was used exclusively for research purposes.

Results

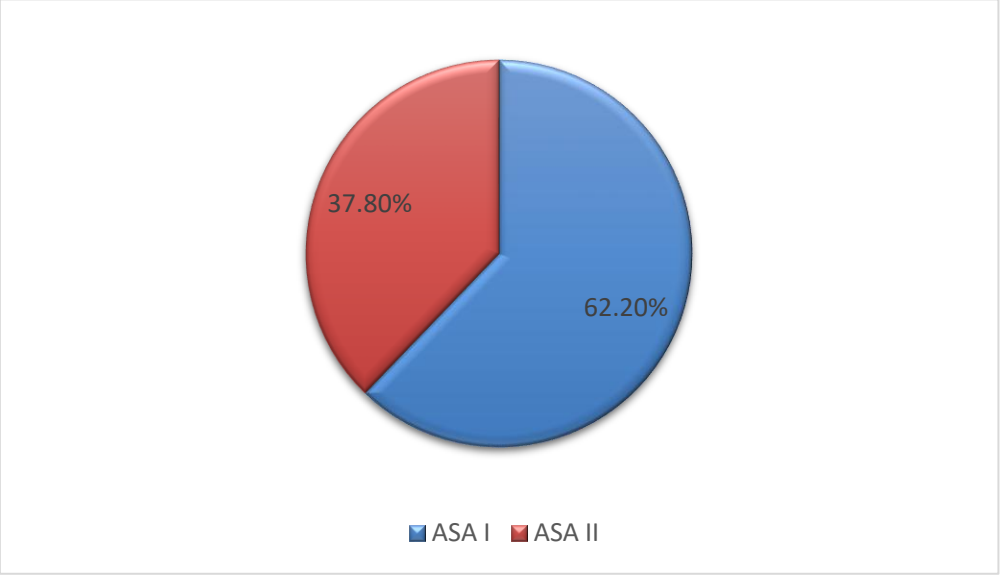
A total of 90 patients undergoing elective surgical procedures under general anaesthesia were included in the study. Postoperative recovery was assessed using both the Modified Aldrete Score and fast track criteria, and the recovery profiles were compared.

Table 1: Demographic Characteristics of Study Participants (n = 90)

Variable	Frequency (%)
Mean age (years)	35.6 ± 9.8
Age 18–30 years	32 (35.6%)
Age 31–40 years	28 (31.1%)
Age 41–50 years	20 (22.2%)
Age >50 years	10 (11.1%)
Male	48 (53.3%)
Female	42 (46.7%)

A total of 90 patients were included in the study. The mean age of the participants was 35.6 ± 9.8 years. The majority belonged to the 18–30 years age group (32; 35.6%), followed by 31–40 years (28; 31.1%), 41–50 years (20; 22.2%), and more than 50 years (10; 11.1%). There was a slight male predominance, with 48 (53.3%) males and 42 (46.7%) females.

Figure 1: ASA Physical Status Distribution



Most patients were classified as ASA physical status I (62.2%), while 37.8% were classified as ASA II.

Table 2: Type of Surgical Procedures

Type of Surgery	Frequency (%)
General surgery	34 (37.8%)
Orthopedic surgery	26 (28.9%)
Gynecological surgery	18 (20.0%)
ENT surgery	12 (13.3%)

Among the 90 patients included in the study, general surgery was the most common procedure, accounting for 34 (37.8%) cases, followed by orthopedic surgery in 26 (28.9%) patients, gynecological surgery in 18 (20.0%) patients, and ENT surgery in 12 (13.3%) patients.

Table 3: Recovery Time According to Modified Aldrete Score

Recovery Parameter	Mean Time (minutes)
Time to achieve Aldrete score ≥9	18.6 ± 4.5

The mean time required for patients to achieve a Modified Aldrete Score of 9 or above was 18.6 ± 4.5 minutes, indicating readiness for discharge from the post anaesthesia care unit.

Table 4: Recovery Time According to Fast-Track Criteria

Recovery Parameter	Mean Time (minutes)
Time to achieve fast-track criteria	14.2 ± 3.8

Patients achieved fast-track recovery criteria earlier with a mean recovery time of 14.2 ± 3.8 minutes.

Table 5: Comparison of Recovery Assessment Methods

Recovery Assessment Method	Mean Recovery Time (minutes)	p value
Modified Aldrete Score	18.6 ± 4.5	0.001
Fast-Track Criteria	14.2 ± 3.8	

The mean recovery time assessed using the Modified Aldrete Score (MAS) was 18.6 ± 4.5 minutes, whereas the mean recovery time assessed using the Fast-Track Criteria (FTC) was 14.2 ± 3.8 minutes. The Fast-Track Criteria identified patients as fit for discharge significantly earlier than the Modified Aldrete Score, and this difference was statistically significant ($p = 0.001$).

Discussion

Comparison of Modified Aldrete Score and fast-track criteria with respectto postoperative recovery following general anaesthesia: A randomized trial. A precise characterisation of recovery in the post anaesthesia care unit (PACU) is vital for patient safety and for deciding when patients can be discharged from PACU. Standardised recovery scoring systems are extensively applied to assess physiological stability as well as consciousness and clinical recovery following anaesthesia. Emphasising the need for structured assessment utilising these recovery scores, Butterworth JF et al [10] and Miller RD et al [11] state that validated recovery scoring systems are important tools to identify patients ready for safe discharge from PACU.

In the current study, patients were recovered significantly earlier when assessed with fast-track versus the Modified Aldrete Score. Mean recovery time according to fast-track criteria was 14.2 ± 3.8 min; patients needed 18.6 ± 4.5 min in order to achieve a Modified Aldrete Score of ≥9. The difference in recovery time between these two assessment means was statistically significant ($p < 0.001$). Fast track criteria may facilitate an earlier definition of patients whose recovery from general anaesthesia has been satisfactory. White PF et al [17] similarly reported that fast-track recovery systems are associated with earlier PACU discharge and patient safety.

The Modified Aldrete Score (MAS) has traditionally been used to assess recovery after anaesthesia based on the parameters of activity, respiration, circulation, consciousness and oxygen saturation. Standardized scoring systems for the recovery period are needed, as highlighted by Apfelbaum JL et al [13]. The main reason behind this is that we use modern anaesthetic agents which come with rapid elimination patterns, thus improve the recovery characteristics and now we can implement fast-track recovery protocols.

In this study, recovery was identified earlier with fast-track criteria than the Modified Aldrete Score. Ghimire R et al [15] reported similar results with the laparoscopic surgery groups recovering within the threshold predefined by Modified Aldrete Score much earlier ($p = 0.002$).

Fast-track recovery protocols have evolved as an important emerging strategy in ambulatory anaesthesia. Their implementation potentially shortened PACU stay without jeopardizing safety ($p < 0.05$), according to Chung F et al [14]. Likewise in the work of Gupta A et al [19] determined that better anaesthetic techniques facilitate earlier return to function and discharge ($p < 0.01$). Moreover Dexter F et al [20] described that effective recovery evaluation techniques could considerably shorter the duration of stay at PACU unit and increase perioperative workflow($p < 0.05$).

Similarly, an integrative review by Hawker RJ et al [16] indicated that the Modified Aldrete Score continues to be commonly employed; however, in contemporary ambulatory surgical practice such fast-track criteria may be more beneficial. In conclusion, the present study showed that both Modified Aldrete Score and fast-track criteria accurately assess recovery from general anaesthesia. Fast-track criteria may allow for an earlier identification of recovery, resulting in a reduction in length of stay and improved PACU efficiency allowing for discharge to occur in a more timely manner..

Strengths

The present study focused exclusively on young adults with Type 2 Diabetes Mellitus, a population in whom diabetic cardiomyopathy is often under-recognized. Comprehensive echocardiographic evaluation using conventional Doppler and tissue Doppler imaging enabled early detection of subclinical left ventricular diastolic dysfunction before the onset of overt cardiovascular disease. The use of standardized clinical, laboratory, and echocardiographic assessment protocols enhanced the reliability and consistency of the study findings.

Limitations

This study has several limitations. First, its cross-sectional design precludes the establishment of a causal relationship between Type 2 Diabetes Mellitus and cardiac structural or diastolic abnormalities. Second, the study was conducted at a single tertiary care center with a relatively modest sample size, which may limit the generalizability of the findings to the broader population. Third, the absence of a non-diabetic control group restricted direct comparison of echocardiographic parameters between diabetic and healthy individuals. Finally, longitudinal follow-up was not performed; therefore, the progression of diastolic dysfunction and its clinical outcomes could not be evaluated.

Conclusion

The current study proved reduced left ventricular diastolic dysfunction in young adults with Type 2 Diabetes Mellitus despite a preserved systolic function, suggesting that cardiac remodeling of some degree is present even in the early phases of the disease. Echocardiographic findings were independently associated with poor glycemic control, diabetes duration, obesity, hypertension and dyslipidemia. Even adolescents who have asymptomatic type 1 diabetes are beginning to develop diabetic cardiomyopathy, indicating that the process begins early in the course of disease. Thus, echo screening nowadays and treat the HGL aggressively plus cardiovascular NiRF is wise early approach to preventing overt heart failure in T2DM even when asymptomatic.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this study.

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