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Critical Rounds Newsletter
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Dear Doctor,

Greetings from Micro Labs Limited. We are happy to bring you **"Critical Rounds Newsletter"** which contain latest and interesting news in the field of Critical Care.

This issue contains:

1. A study on evaluating the Restrictive Red Blood Cell Transfusion in Critically Injured Patients (RESTRIC) in trauma

2. A study on assessing the respiratory quotient's prognostic value in patients receiving extracorporeal cardiopulmonary resuscitation

3. Relationship between Variations in Plasma Metabolism and Clinical Results of Sepsis

4. A rare case of BRASH syndrome with hypoglycemia and impaired mental status.

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Looking forward to your valuable feedback

Best Regards,
Medical Team, Micro Labs Limited

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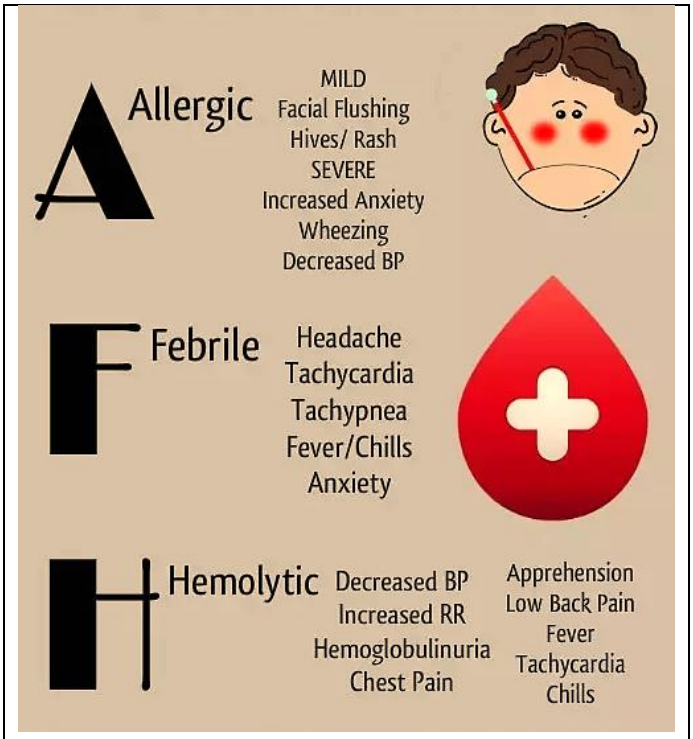
1. A study on evaluating the Restrictive Red Blood Cell Transfusion in Critically Injured Patients (RESTRIC) in trauma

Introduction:

The mortality and complication rates were comparable between the groups, despite the lack of statistical significance in the non-inferiority of the restrictive vs. liberal transfusion strategy for 28-day survival.

Bleeding is a leading cause of mortality following severe injuries. Even though early haemostatic techniques are most vital, resuscitation using crystalloid and blood products also plays a significant part in the early phase of managing patients with severe trauma. While the use of fresh frozen plasma transfusions in the acute post-injury period has been extensively studied in the therapy of trauma-associated coagulopathy[1]. The most recent international standards, the fifth edition of the European standards for the Management of Major Bleeding and Coagulationopathy Following Trauma, propose target haemoglobin levels of 7-9 g/dL. The effectiveness of red blood cell transfusion in patients with severe trauma has not been ful ly studied, and the appropriate haemoglobin target level during the immediate post-injury and resuscitation stages is unknown[2]. The purpose of this study was to determine if a restrictive transfusion approach was clinically superior than a liberal transfusion strategy during the acute post-injury phase.



Blood transfusion reaction

Methods:

This multicentre, cluster-randomized, crossover, non-inferiority trial was done at 22 tertiary emergency care facilities and included adult patients with serious trauma who were at risk of substantial bleeding. 422 people were included in the RESTRIC experiment, which recruited 1045 participants from 22 institutions. The institutions were assigned either a conservative or liberal transfusion approach (target haemoglobin levels: 7-9 or 10-12 g/dL, respectively). The techniques were used on patients as soon as they arrived at the emergency department. The primary outcome was survival after 28 days in the emergency department. Transfusion volume, complication rates, and event-free days were all secondary outcomes. The margin of non-inferiority was established at 3%.

Results:

Patients in the restricted (n=216) and liberal (n=195) approach groups had 28-day survival rates of 92.1% and 91.3%, respectively. The adjusted odds ratio for 28-day survival was 1.02 in the restricted versus liberal approach group. Glasgow Outcome Scale scores upon hospital discharge did not differ across the groups. The restricted approach group had lower transfusion volumes and haemoglobin levels than the liberal strategy group. There were no differences in complication rates or event-free days across groups. Haemoglobin levels were 12.2 g/dL and 11.9 g/dL, respectively, when patients in the restriction and liberal RBC transfusion method groups arrived at the emergency department. From three hours to seven days after arriving at the emergency department(ED), the haemoglobin levels in the group receiving a liberal RBC transfusion approach varied from 10 to 11 g/dL. Haemoglobin levels between 3 hours and 7 days after arriving at the ED were around 9 g/dL in the group using the limited RBC transfusion method. The proportion of patients who did not get RBC transfusion was greater in the restrictive RBC transfusion strategy group compared to the liberal RBC transfusion strategy group (Fig. 1).

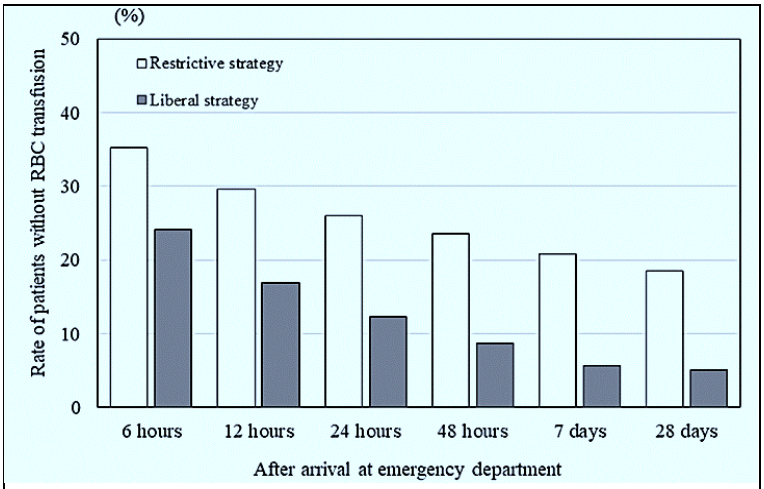


Fig. 1 Proportion of patients who did not receive RBC transfusion. Grey, liberal RBC transfusion approach; white, limited RBC transfusion strategy. RBC stands for red blood cell.

Discussion:

The implementation of the restrictive RBC transfusion technique did not statistically demonstrate noninferiority to the liberal RBC transfusion method. However, the 28-day survival rate and survival time did not differ significantly across groups. The mortality and complication rates were comparable between the groups, although the non-inferiority of the restrictive vs liberal transfusion method for 28-day survival being not statistically significant [(2)]. In a similar study by Hessam H. Kashani et al showed that, at the longest follow-up, there was no apparent difference in mortality between the restrictive and liberal transfusion approaches [(3)].

Conclusion:

The study's findings indicate that even though the mortality and complication rates were equal between the groups, the non-inferiority of the limited vs. liberal transfusion strategy for 28-day survival was not statistically significant. The restricted transfusion approach results in a smaller transfusion volume.

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2. A study on assessing the respiratory quotient's prognostic value in patients receiving extracorporeal cardiopulmonary resuscitation

Introduction:

When Extracorporeal cardiopulmonary resuscitation (ECPR) was performed on patients, respiratory quotient (RQ) was not associated with a poorer neurologic outcome.

Extracorporeal cardiopulmonary resuscitation (ECPR), also known as extracorporeal membrane oxygenation (ECMO), is a resource-intensive and expensive mode of life support that is increasingly used to treat challenging patients who have suffered cardiac arrest. The chance of various neurological outcomes following ECPR is one of the most crucial outcomes, thus a tool that is rapid, easy, and uses readily accessible clinical information to estimate the likelihood of these outcomes might be very helpful in the treatment of possible ECPR candidates[1]. In patients with reversible causes of cardiac arrest who have received more than 10 minutes of traditional cardiopulmonary resuscitation (CPR), the American Heart Association guidelines now advise considering ECPR as a substitute technique. As ECPR is used more frequently, it is essential to comprehend the right treatment to achieve hemodynamic optimisation following ECPR in order to achieve better results. Preserving higher cortical brain function is one of the main objective of CPR, including ECPR. Although the respiratory quotient (RQ) can be employed as a tissue hypoxia marker in a variety of therapeutic scenarios, its predictive value in patients undergoing extracorporeal cardiopulmonary resuscitation (ECPR) is unknown. The purpose of this study was to investigate if RQ evaluated shortly after starting ECPR may predict unfavourable neurologic outcomes.

Methods:

Retrospective analysis of medical records of adult patients who had ECPR and were subsequently admitted to critical care units and for whom RQ could be determined. Patients were divided into groups with positive and negative neurologic outcomes. RQ's prognostic importance was compared to other clinical traits and tissue hypoxia indicators. The primary outcome was the patient's neurologic state at the time of discharge from the hospital. The Glasgow-Pittsburgh cerebral performance categories (CPC) scale was used to assess the patient's neurological condition. CPC values of 1 and 2 were considered to indicate positive neurologic outcomes, whereas 3, 4, and 5 were considered to indicate negative neurologic outcomes. The length of hospital stay following ECPR and hospital mortality were the secondary outcomes.

Results:

During the research period, 155 patients were eligible for analysis. 90 of them (58.1%) showed inferior neurologic results. In comparison to the group with excellent neurologic

result, the group with poor neurologic outcome had a greater incidence of out-of-hospital cardiac arrest (25.6% vs. 9.2%) and a longer duration from cardiopulmonary resuscitation to pump-on (33.0 vs. 25.2 minutes). Compared to the group with a good neurologic result, the group with a poor neurologic outcome exhibited higher RQ (2.2 vs. 1.7) and lactate levels (8.2 vs. 5.4 mmol/L) for tissue hypoxia indicators. Age, cardiopulmonary resuscitation to pump-on time, and lactate levels over 7.1 mmol/L were significant indicators for a worse neurologic outcome but not RQ in a multivariable analysis. All patients had a median initial RQ of 2.0 (IQR, 1.4-3.0) In the group with bad outcomes, the median initial RQ was 2.2 (IQR, 1.5-3.6), but in the group with favourable outcomes, it was 1.7 (IQR, 1.1-2.8) (P=0.021) (Table 1).

Table 1. characteristics of the initial tissue hypoxia and the clinical result

Variable	Good neurologic outcome (n=65)	Poor neurologic outcome (n=90)	P-value
Initial tissue hypoxia parameter			
RQ	1.7 (1.1–2.8)	2.2 (1.5–3.6)	0.021
ΔpCO_2 (mm Hg)	7.0 (4.6–11.8)	9.7 (5.7–14.8)	0.093
Lactate (mmol/L)	5.4 (2.8–10.4)	8.2 (5.1–12.4)	0.004
Clinical outcome			
Hospital mortality	0	79 (87.8)	<0.001
Hospital length of stay after ECPR (day)	22.0 (11.5–56.5)	5.0 (2.0–19.0)	<0.001
Cerebral performance category score	1.0 (1.0–1.0)	5.0 (4.0–5.0)	<0.001

Values are shown as the median. (interquartile range).
RQ: respiratory quotient; ΔpCO_2: venous-arterial difference in CO_2 tension; ECPR: extracorporeal cardiopulmonary resuscitation.

Discussion:

The current study examined the potential of RQ evaluated during the first 24 hours after ECPR to predict neurologic outcomes in a reasonably large number of ECPR cases. The majority of the patients in this research had abnormal RQ values of >1, which is significantly different from a few minor studies done in post-CPR patients receiving targeted temperature following ROSC [(2)]. In contrast, a study by Amy Uber et al showed that 71% of RQ values were below 0.7, and the median RQ was 0.66 (IQR 0.63, 0.70). Patients with initial RQ <0.7 had a 17% survival rate whereas those with initial RQ > 0.7 had a 64% survival rate (p =.131) [(3)].

Conclusion:

This study concludes that RQ was not related with a worse neurologic outcome in individuals who had ECPR.

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3. A study on evaluating the long-term outcomes between ICU patients with persistent delirium, non-persistent delirium, and no delirium.

Introduction:

Patients with persistent delirium (PD) were more likely than those with nonpersistent delirium (NPD) or no delirium (ND) to develop cognitive impairment a year after leaving the ICU.

Delirium is an acute neuropsychiatric disease that develops in vulnerable people and is characterised by a disruption in awareness and cognition. Delirium is a result of a medical condition and occurs as a result of medical conditions. ICU patients with persistent delirium (PD), defined as ≥14 delirium days, stayed in the facility for longer periods of time and had more fatalities. [(1)]. Delirium is a frequent consequence for patients referred to critical care units (ICUs), affecting about 30% of general ICU populations and up to 80% in those receiving mechanical ventilation. ICU-acquired delirium is linked to up to a threefold increase in length of stay and duration of mechanical breathing, which has a significant impact on caregivers, healthcare services, and rising healthcare expenditures. There is presently no documented treatment or prevention approach for ICU-acquired delirium [(2)]. Only a small amount of research on the long-term prognoses of patients with persistent delirium has been done, and the criteria and PD cut-off points employed in this study differed [(1)]. The current study aimed to compare physical, mental, and cognitive outcomes, frailty, and quality of life one year after ICU discharge between patients with persistent delirium (PD), nonpersistent delirium (NPD), and no delirium (ND).

Methods:

A longitudinal cohort study of adult ICU patients from two institutions was conducted. Of the 2400 patients who completed both surveys, 529 (22.0%) experienced delirium, 35 (6.6%) had PD, and 494 (93.4%) had NPD. Patients' pre-ICU health state and 1-year post-ICU health status were assessed using questionnaires on physical, mental, and cognitive health, frailty, and QoL. Data on delirium were collected throughout patients' whole hospital stay. PD (≥14 days' delirium), NPD (<14 days' delirium), and ND patients were the three groups of patients.

Results:

In comparison to ND patients, individuals with delirium (both PD and NPD) had worse 1-year outcomes in each individual health category. Patients with delirium were more likely to feel tired, to experience anxiety and depression symptoms, and to have cognitive impairment. They also reported significantly more cognitive impairment and a lower quality of life (median EQ-5D-5L index value, 0.72 and 0.79 vs. 0.85, both $p < 0.001$) (table 1). Only long-term cognitive impairment was substantially linked with PD after adjustment (aOR 3.90; 95%CI 1.31-11.63).

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Table 1: patient reported results over time in several health categories.

Domains	Total (N = 2400)		Persistent delirium (PD) (n = 35)		Non-persistent delirium (NPD) (n = 494)		No delirium (ND) (n = 1871)	
Physical health								
Fatigue, *n* (%)	1247	(51.9)	30	(85.7)[b,c,*]	302	(61.1)[c,*]	915	(48.9)
New physical complaints, median [IQR]	1	[0–3]	3	[1–5][c]	2	[0–4.25][c,*]	1	[0–3]
Mental health								
Anxiety symptoms, *n* (%)	467	(19.5)	13	(37.1)[c]	135	(27.3)[c,*]	319	(17.0)
Depression symptoms, *n* (%)	503	(21.0)	15	(42.9)[c]	142	(28.7)[c,*]	346	(18.5)
PTSD symptoms, *n* (%)	120	(5.0)	1	(2.9)	34	(6.9)	85	(4.5)
Cognitive health								
Abnormal cognitive functioning, *n* (%)	223	(9.3)	7	(20.0)[c]	62	(12.6)[c]	154	(8.2)
Quality of life								
Frail, *n* (%)	223	(9.3)	12	(34.3)[b,c,*]	72	(14.6)[c,*]	139	(7.4)
EQ-5D-5L index value, median [IQR]	0.85	[0.73–1.00]	0.72	[0.59–0.85]	0.79	[0.65–0.89]	0.85	[0.74–1.00][a,*,b,*]

Abbreviation definitions: EQ-5D-5L = EuroQol 5-dimensional 5-level; IQR = interquartile range; PTSD = post-traumatic stress disorder.
[a] Significantly higher than persistent delirium; [b] Significantly higher than non-persistent delirium; [c] Significantly higher than no delirium; *$P < 0.001$. All significance values were adjusted by the Bonferroni correction for multiple testing.

Discussion:

This study shown that, in comparison to patients without delirium, PD and NPD patients had poorer results in the areas of physical, mental, and cognitive health and reported lower quality of life one year following ICU admission. The current investigation has demonstrated that the onset of cognitive impairment is related to both the occurrence and the length of delirium [(1)]. These results are in line with prior research byWilcox ME et al on delirium, where it was shown that deliriums with longer durations were more likely to cause cognitive impairment [(3)].

Conclusion:

Current study concludes that patients with PD were more likely than those with NPD or ND to develop cognitive impairment a year after leaving the ICU. Patients with PD and NPD were more likely to have impairment in each aspect of health (physical, mental, and cognitive) compared to ND patients.

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4.A rare case of BRASH syndrome with hypoglycemia and impaired mental status

Introduction:

Patients with chronic kidney disease who use atrioventricular nodal-blocking medications carry the risk of deteriorating renal function, hyperkalemia, and bradycardia. Low cardiac output causes renal hypoperfusion and malfunction, which leads to shock as a result of this vicious cycle. Hyperkalemia may persist due to kidney damage. This pathophysiological vicious looping process is now known as BRASH syndrome, an abbreviation that stands for bradycardia, renal failure, atrioventricular (AV) blockage, shock, and hyperkalemia[1]. Patients with BRASH syndrome can exhibit a variety of signs and symptoms and are frequently in severe condition, but if the illness is diagnosed early, treatment options are available, and the prognosis may be good[2]. This case report describes a 74-year-old patient who was admitted to the emergency room with bradycardia, an altered mental status, and a history of several chronic illnesses.

Improving understanding of various presenting signs and symptoms, as well as the influence of other acute and chronic illnesses, can assist healthcare professionals in recognising and managing BRASH syndrome more quickly, thereby improving survival and patient outcomes.

Case Presentation:

This case study describes a 74-year-old female patient who was admitted to the emergency room with a suspected stroke. She complained of a sudden generalised weakness, her speech became slurred, and she had very little mobility. The patient had a history of many chronic diseases. She had a number of chronic illnesses, including metabolic syndrome, arterial hypertension, obesity (BMI 50,78), insulin-dependent type 2 diabetes mellitus (DM) with chronic microvascular organ complications, chronic venous insufficiency, chronic heart failure (NYHA 4), chronic kidney disease (G1A2 KDIGO), and persistent atrial fibrillation with left anterior fascicular. She also had a history of a cerebrovascular accident (CVA) two years prior. She also took potassium supplements and vitamins in addition to rivaroxaban, carvedilol, perindopril, urapidil, atorvastatin, amlodipine, eplerenone, furosemide, empaglifozin, insulin, potassium tablets, and vitamins. She displayed altered mental status and a Glasgow Coma Scale (GCS) of 14 (4-4-6) upon clinical examination by the EMS team. She also displayed significant dysarthria, patent airways, blood pressure (BP) of 170/100 mmHg, respiratory rate of 20 breaths/min, SpO2 of 95% on room air, glycemia of 91.8 mg/dL, and heart rate of 31 beats/min (bpm) (Fig. 1) With a heart rate of 45 beats per minute, emergency medical services(EMS) administered 1 mg of Atropine..

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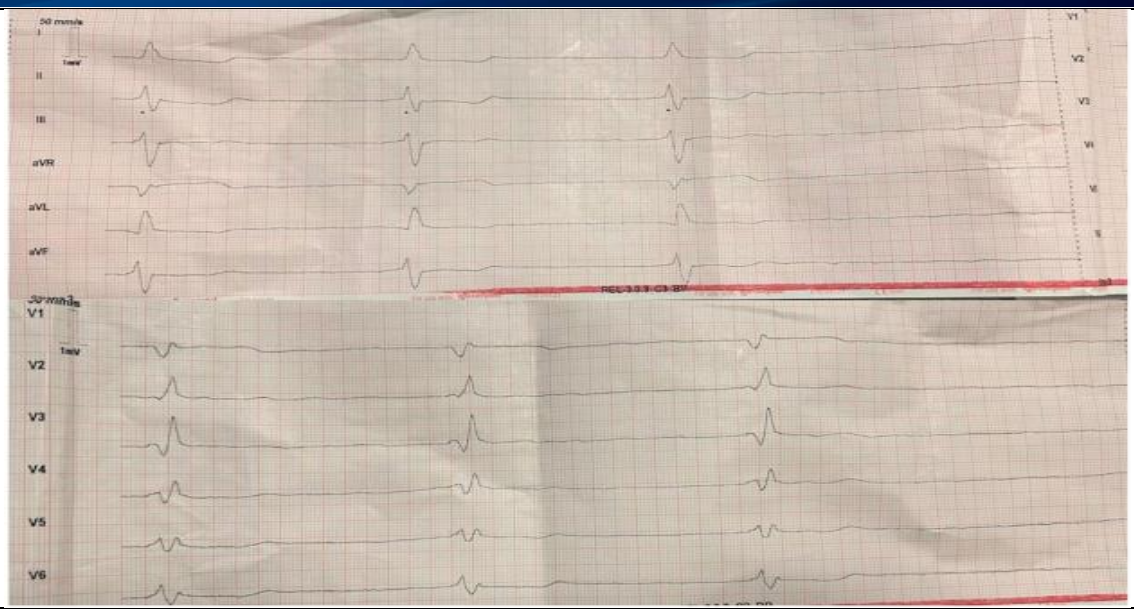

Fig 1: Emergency medical services got an ECG that showed atrial fibrillation, a right bundle branch block, a slow ventricular response, and a heart rate of 30 beats per minute.

When she arrived at the emergency department, her clinical examination revealed the following: a patent airway, a SpO2 of 93%, repeated readings of her blood pressure in both hands of 70/30 mmHg, and a heart rate of 40–45 bpm with atrial fibrillation and a weak ventricular response (Fig. 2).

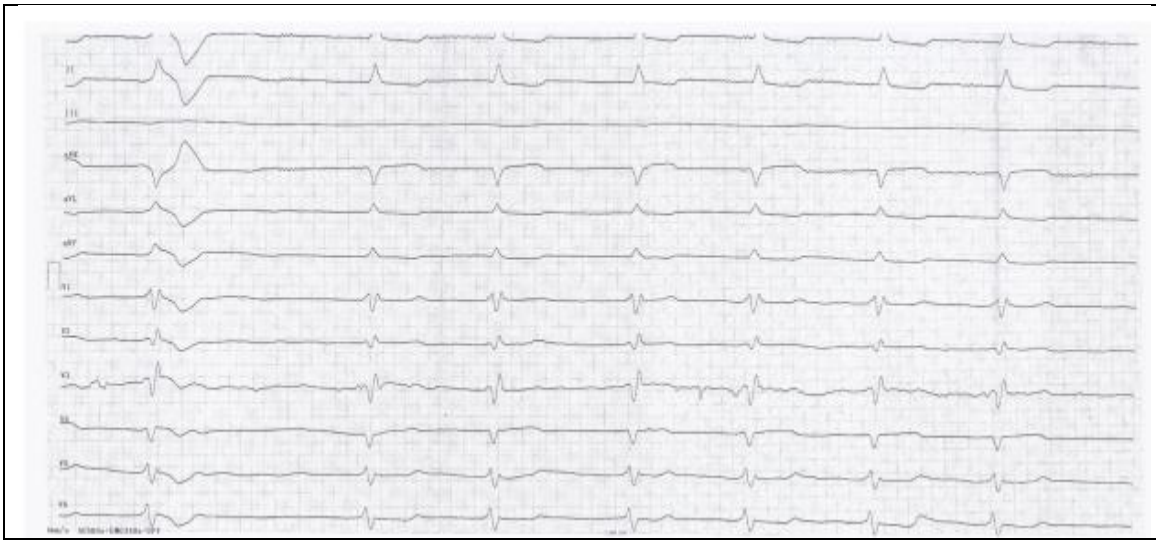

Fig 2: After receiving 1 mg of atropine, the ECG taken in the emergency room showed atrial fbrillation, a right bundle branch block, and a slow ventricular response, with a heart rate of 45 beats per minute.

Her labs were obtained, and she was put on a heart monitor. With a heart rate response of 50–55 bpm and only a little rise in blood pressure, she was placed on a dopamine drip at 10 mcg/kg/min right away. Fluids were given to her, and her dopamine drip was titrated to 15 mcg/kg/min. The findings of a head computed tomography scan were normal, but the laboratory tests revealed renal failure, hyperkalemia, acidosis, and concurrent increasing hypoglycemia. The patient was identified as having the BRASH syndrome, which is characterised by a vicious cycle of atrioventricular nodal blockade brought on by the potentiated effect of beta-blockers or calcium channel blockers combined with progressive

hypoglycemia caused by the suspected accumulation of anti-diabetic medications, which affected the patient's presentation and initial triage in the emergency room. In order to get additional management, she was shifted to the critical care unit. While on intravenous fluids with diuresis assisted by furosemide, her potassium, glucose, and renal function measurements returned to baseline. She was eventually discharged from the hospital after 12 days with outpatient follow-up advice. Her insulin was adjusted and slightly reduced, her beta-blocker therapy was withdrawn, and she was kept on a modest dose of calcium channel blockers in addition to the rest of her chronic medications.

Discussion:

The clinical condition known as BRASH syndrome has a complex aetiology and clinical presentation. There are multiple pathways that lead to the start of the BRASH syndrome, which includes bradycardia, renal failure, atrioventricular nodal blockage, shock, and hyperkalaemia. using the careful management of various disorders, the primary goals of treating BRASH syndrome are the resuscitation and stabilisation of essential functions, largely using vasopressors and drugs [(2)]. A study by Farkas Joshua D et al demonstrated that the most frequent mistake made while treating BRASH syndrome is focusing entirely on treating one aspect of the condition, such as hyperkalemia. furthermore, this study showed fluid resuscitation, treatments for hyperkalemia (intravenous calcium, insulin/glucose, beta agonists, diuresis), control of bradycardia (which may need epinephrine infusion), and more advanced therapies (lipid emulsion, glucagon, or high-dose insulin infusion) if necessary are all included in treatment [(3)].

Conclusion:

This case study highlights the need of considering unusual and abnormal medical condition presentations, particularly in elderly adults who may have many comorbidities. Early detection and management of such circumstances are critical for improving patient outcomes.

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