Critical Rounds

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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 Retrospective analysis of patients with pulmonary hypertension who underwent emergent endotracheal intubation and their outcomes and prognostic factors

2. Reduced renal cortical perfusion is related to the severity of acute kidney injury in septic shock patients, regardless of changes in renal blood flow and sublingual microcirculatory impairment.

3. A study on complex mechanical ventilation weaning and early hospital outcome prediction in patients with tracheostomies.

4. A case report on neonatal cardiac tamponade, a potentially fatal condition brought on by a peripherally inserted central catheter

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Looking forward to your valuable feedback

Best Regards,

Medical Team, Micro Labs Limited

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1. A Retrospective analysis of patients with pulmonary hypertension who underwent emergent endotracheal intubation and their outcomes and prognostic factors

Introduction:

A condition known as pulmonary hypertension (PH) is one that has a high morbidity and mortality rate. As right ventricular (RV) failure, which is the main cause of death, frequently complicates conventional procedures like volume resuscitation and mechanical ventilation, managing pulmonary hypertension (PH) patients in a critical care setting is difficult. Patients with pulmonary hypertension (PH) who have emergent endotracheal intubations (ETI) have a higher mortality rate. There hasn't been any research done on post-intubation therapies that might improve survival in this cohort.[2] Researchers in this study assess the early clinical features and complications that occur after emergent endotracheal intubation and look for predictors of adverse outcomes in this post-intubation period.

In comparison to individuals without pulmonary hypertension, those with pulmonary hypertension had worse outcomes following emergent endotracheal intubation.

Methods:

Adult patients with groups 1 and 3 PH who underwent emergent intubation in the medical and liver transplant ICUs at a tertiary medical centre were the subjects of this retrospective cohort analysis. Charlson Comorbidity Index was used to match PH patients with non-PH patients for comparison. Inpatient fatalities and 24-hour post-intubation results were the main outcomes. The 24-hour post-intubation secondary outcomes of the PH and control cohorts were compared.

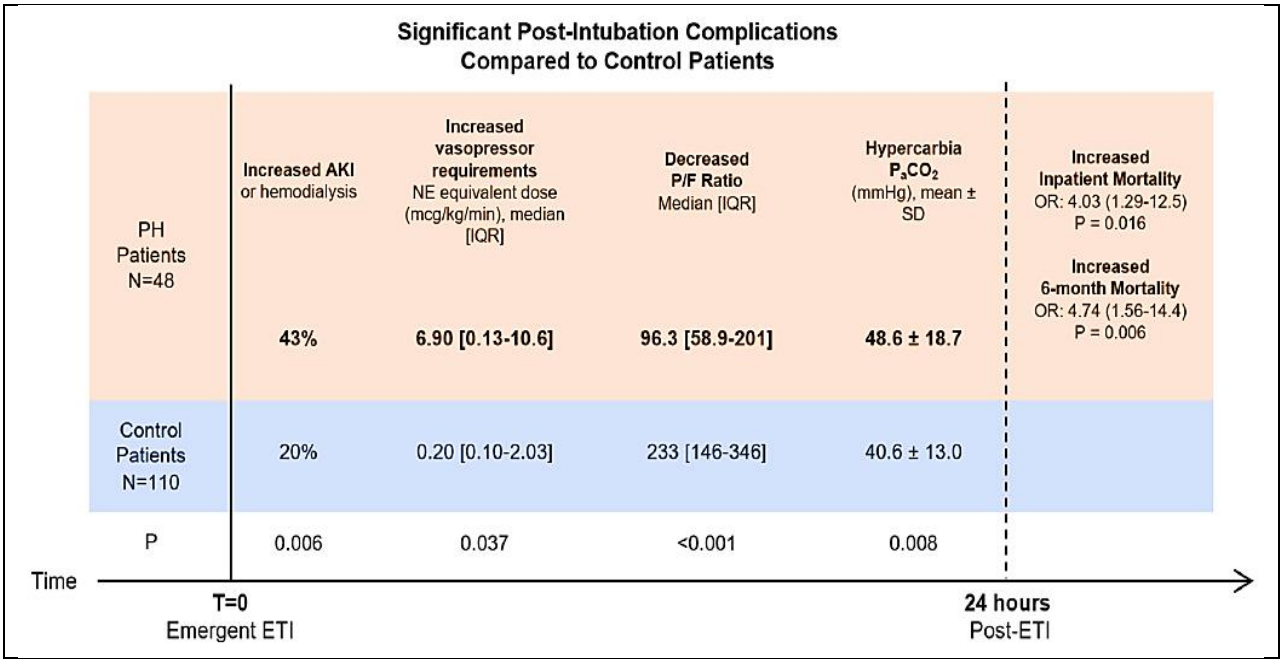
Results:

A total of 110 non-PH patients and 48 PH patients were found by researchers. Although pulmonary hypertension was linked to inpatient mortality (OR 4.03, 95%CI 1.29-12.5, P =.016) following intubation, it was not linked to higher 24-hour mortality (OR 1.32, 95%CI 0.35-4.94, P=.18). Acute kidney injury occurred more frequently in PH patients within 24 hours of intubation (43.5% vs. 19.8%, P =.006) and they needed greater doses of norepinephrine (6.90 [0.13-10.6] mcg/kg/min, vs. 0.20 [0.10-2.03] mcg/kg/min, P=.037). Additionally, PH patients had a poorer median P/F ratio (PaO2/FiO2) (96.3 [58.9-201] vs. 233 [146-346] in non-PH, P=.001) than non-PH patients. In the PH cohort, mortality was linked to an increase in PaCO2 following intubation (post-intubation change in PaCO2 +5.14±16.1 in non-survivors vs. 18.7±28.0 in survivors, P=.007).

Discussion:

In this retrospective analysis of patients with pulmonary hypertension who underwent emergent ETI in comparison to a matched control cohort, researchers noted increased vasopressor needs, hypoxemia, hypercapnia, and AKI in the initial postintubation period in this cohort of PH patients along with overall poor survival in PH patients. This is the only study that to researchers that has examined the period immediately following intubation in PH

patients in direct comparison to a matched control cohort.[2] The majority of studies, in contrast, describe the pathophysiology of PH in intubation and mechanical ventilation and provide precautions to prevent RV failure.[1,7]



Summary illustration of early, post-intubation complications 24-h after intubation in pulmonary hypertension patients compared to control patients.

Conclusion:

In comparison to individuals without pulmonary hypertension, those with pulmonary hypertension had worse outcomes following emergent endotracheal intubation. More significantly, this research data implies that the PH group's first 24 hours after intubation reflect a particularly sensitive timeframe that may affect long-term outcomes. To increase survival in this cohort, early post-intubation measures may be essential. The survival of PH patients who undergo emergent intubations may be improved by doctors' awareness of these early post-intubation complications.

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2. Reduced renal cortical perfusion is related to the severity of acute kidney injury in septic shock patients, regardless of changes in renal blood flow and sublingual microcirculatory impairment.

Introduction:

In hospitalised and critically ill patients, sepsis-associated acute kidney damage (AKI) is a frequent consequence that raises the likelihood of developing chronic comorbidities and is linked to a very high fatality rate.[1] One of the most frequent causes of acute kidney damage (AKI) in critically ill patients is septic shock, which has a death rate of about 50%. AKI brought on by septic shock has been linked to decreased renal perfusion. Uncertainty persists regarding the relative contributions of macro- and microcirculatory blood flow as well as the extent to which decreased perfusion is a renal-specific phenomena or a component of a broader systemic shock state. In the field of critical disease, contrast-enhanced ultrasound (CEUS) is a new imaging method that uses inert microbubbles that are highly echogenic to identify sites of microvessel perfusion within organs.[2] In order to advance the knowledge of the pathogenesis of this significant condition, the current study aims to examine renal cortical perfusion using CEUS in a larger cohort of patients with septic shock, along with precise measurement of cardiac output, renal blood flow, and flow in the sublingual microcirculation.

Critically ill septic patients who develop AKI frequently have renal cortical hypoperfusion, which does not seem to be related to changes in macrovascular renal blood flow or cardiac output.

Methods:

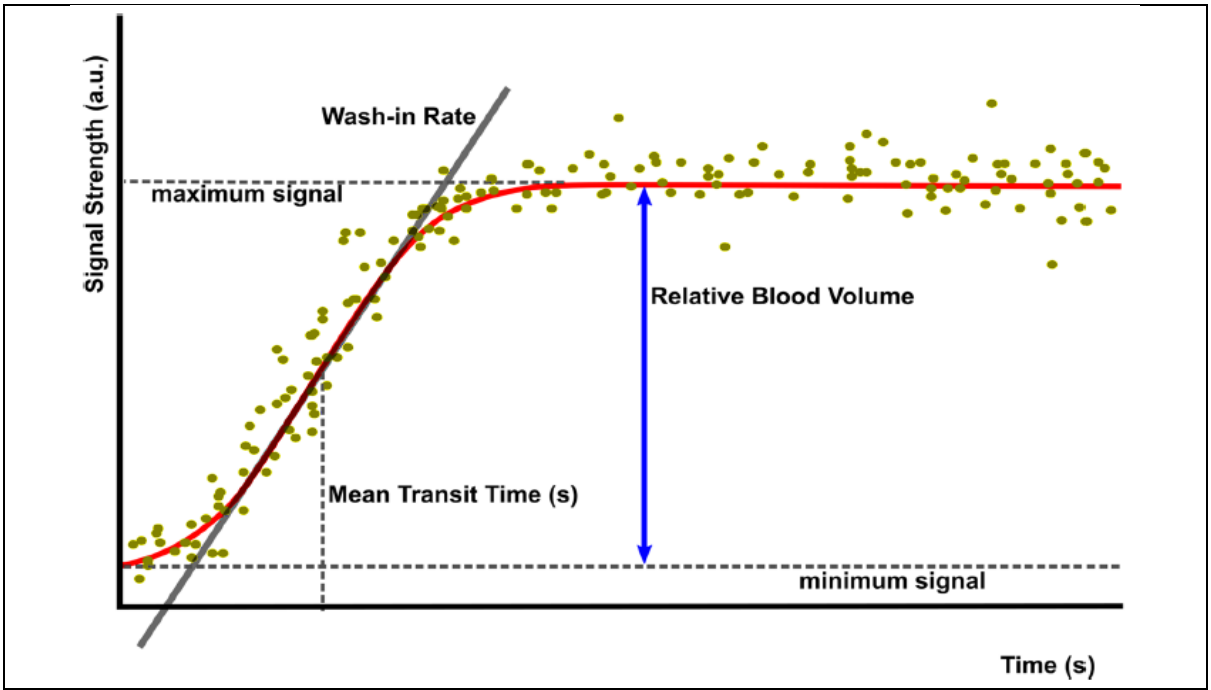
A prospective, longitudinal, single-center observational study was conducted. Using contrast-enhanced ultrasound, assessments of renal cortical perfusion were done in 50 patients with septic shock and ten healthy volunteers on Days 0, 1, 2, and 4 following ICU admission (CEUS). Transthoracic echocardiography was used to measure cardiac output in real time. Utilizing the velocity time integral and vessel diameter, the blood flow via the renal arteries was determined. Utilizing portable video microscopy, the sublingual microcirculation was evaluated. The degree of AKI was used to categorise patients: Non-severe is KDIGO 0-2, whereas severe is KDIGO 3.

Results:

Patients with severe AKI (37/50) exhibited longer CEUS mean transit times (mTT) at treatment initiation (10.2 vs. 5.5 s, $p < 0.05$), as well as lower wash-in rates (WiR) (409 vs. 1203 au, $p < 0.05$) and perfusion indices (PI) (485 vs. 1758 au, $p < 0.05$); these differences maintained throughout the duration of the trial. However, there were no variations in the renal blood flow, cardiac index, or renal resistive index. At study enrollment or at any later time point, sublingual microcirculatory measures did not substantially differ between groups. At the time of study enrollment, the severe AKI group had greater lactate levels, but these differences did not last, and there were no changes in either ScvO2 or ScvCO2- SaCO2 between the groups. Noradrenaline dosages were increased for patients with severe AKI.

Discussion:

Researchers describe measurements of regional and systemic macrovascular blood flow along with assessments of blood flow and perfusion in the kidney and in a distinct microcirculatory bed for the first time in a healthcare setting. The main conclusion of the current study is that in septic shock patients, the degree of renal cortical hypoperfusion was related to the severity of acute kidney injury, and that this hypoperfusion did not seem to be related to changes in regional or systemic blood flow.[2] Comparisons with the current investigation are limited because the CEUS model utilised by the researchers depended on bolus contrast administration and mostly reported intensity-based variables to describe cortical perfusion. When septic shock patients were compared to other critically sick patients, renal cortical perfusion was reduced, but a study conducted by Harrois et al. was unable to show any changes based on the presence or absence of AKI in their small group.[3]



Schematic diagram of typical destruction-replenishment kinetics following the administration of ultrasound contrast

Conclusion:

Critically sick septic patients who develop AKI often have persistent renal cortical hypoperfusion, which doesn't seem to be related to changes in cardiac output or macrovascular renal blood flow. Cortical hypoperfusion does not appear to be linked to variations in sublingual microcirculation, which suggests a distinct renal aetiology that might be treated.

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3. A study on complex mechanical ventilation weaning and early hospital outcome prediction in patients with tracheostomies.

Introduction:

In order to enable weaning off the ventilator machine, tracheostomies are typically recommended for severely ill ICU patients who require extended mechanical ventilation.[1] Patients with tracheostomies have a poor prognosis after leaving the intensive care unit and demand significant healthcare resources. Data on outcomes prediction at hospital discharge, however, is lacking.[2] The major purpose of the study was to investigate the relationship between patient characteristics, tracheostomy technique, MV management, and the use of anaesthesia and analgesia prior to tracheostomy surgery and patients' outcomes at hospital discharge.

Hospital mortality of patients who underwent tracheostomy because of complex Mechanical Ventilation weaning was high.

Methods:

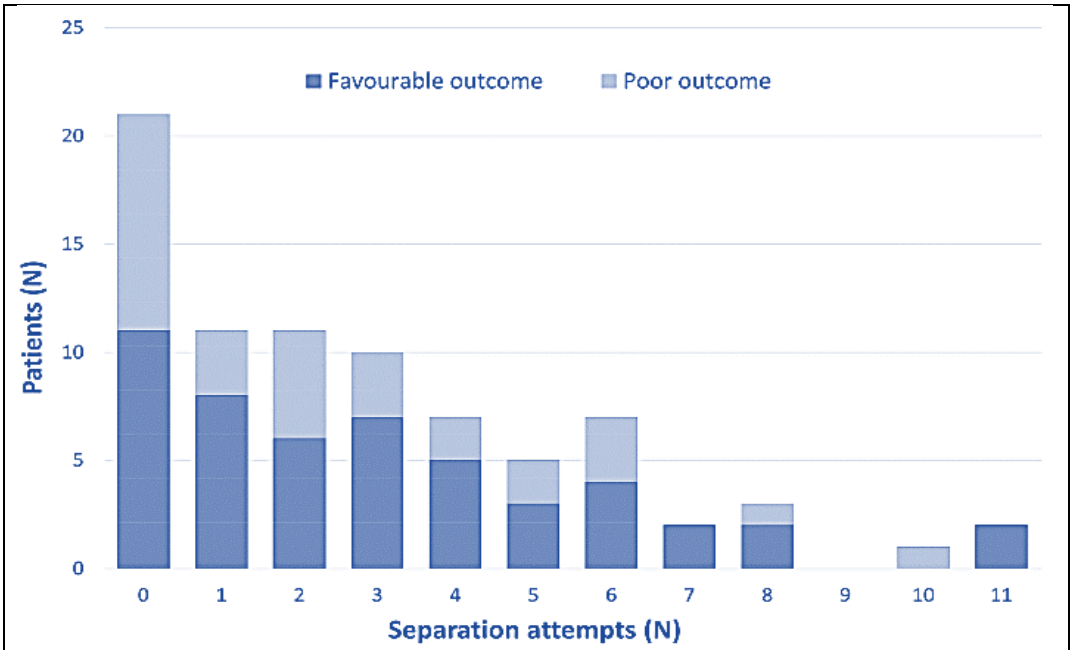
Retrospective single-center investigation carried out at the University Hospital's medical-surgical adult intensive care unit. Inclusion criteria included tracheostomized adult patients who had been mechanically ventilated for at least 72 hours at admission to the Adult ICU. Weaning off mechanical ventilation and tracheostomy management and weaning were carried out for all of the patients who were enrolled in accordance with the specific ICU guidelines. Researchers gathered information on the patients' characteristics and ICU admission cause. The cause of the intubation was also noted. Additionally, scores for the Sequential Organ Failure Assessment (SOFA), Simplified Acute Physiology Score II (SAPS II), Clinical Frailty Score, and Nutrition Risk Screening (NRS) were gathered. Using univariate and multivariate logistic regressions, the researchers examined for patient characteristics, breathing parameters, sedation, and analgesic use (pre-tracheostomy) that are linked with favourable and unfavourable outcomes (post-tracheostomy).

Results:

Eighty tracheostomized patients (28% women, 60 [52-71] years) were included. 23 patients (20.8%) required intubation for neurological conditions. The interval between tracheostomy and intubation was 14.7 [10–20] days. Thirty individuals (37.5%) received unfavourable results (19 patients deceased and 11 still tracheostomized at hospital discharge). 11 patients were all initially intubated for neurological reasons and were all discharged with tracheostomies. Older age and higher body mass index (BMI) were linked to worse outcomes in univariate logistic regressions (OR 1.18 [1.07-1.32] and 1.04 [1.01-1.08], p p<0.001 and p = 0.025, respectively). Poor outcomes weren't linked to any MV characteristics. Higher BMI and older age were also linked to poor outcomes in the multiple logistic regression model (OR 1.21 [1.09-1.36] and 1.04 [1.00-1.09], p <0.001 and p = 0.046, respectively).

Discussion:

Researchers looked at the ventilation settings, sedation/analgesia, and outcomes of patients who had tracheostomies placed during their ICU stays and were ventilated for more than 72 hours for both neurological and non-neurological causes. Patients with tracheostomies for difficult weaning and intubation for all causes have high mortality rates. Patients intubated for both neurological and non-neurological reasons are included in the current study cohort, which has the features of a general ICU population and includes both medical and surgical patients. Researchers discovered that tracheostomized patients who were first intubated for neurological reasons had comparatively low ICU mortality compared to other studies[3], but that the overall global group of patients had a high hospital mortality that was consistent with the literature.[4]



Separation attempts before tracheostomy. Number of separation attempts by patients for each group of outcome Figure illustrates the number of patients with favorable and poor outcome according to the number of separation attempts before tracheostomy.

Conclusion:

Patients who had their tracheostomies performed due to complicated MV weaning had a high hospital death rate. Patients with tracheostomies in place were regularly discharged from the acute care hospital after being intubated for neurological reasons. Only BMI and older age were linked to poor outcomes following tracheostomy in univariate and multivariate logistic regressions for patients undergoing prolonged MV weaning.

References:

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4. A case report on neonatal cardiac tamponade, a potentially fatal condition brought on by a peripherally inserted central catheter

Introduction:

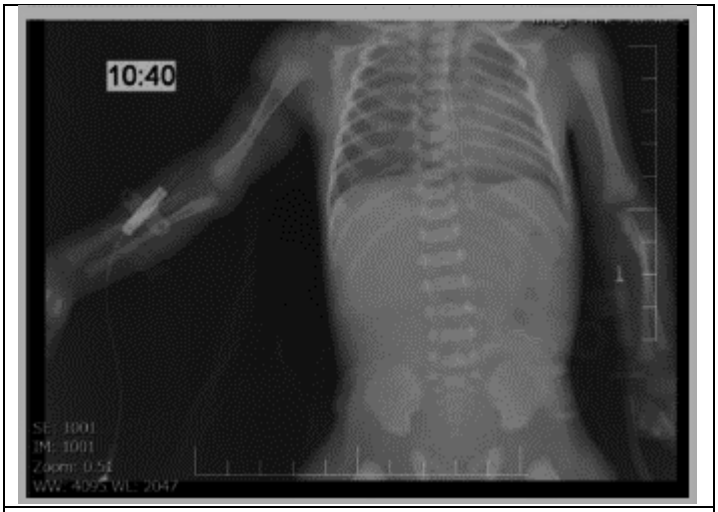
PICCs, or peripherally implanted central venous catheters, are frequently employed and helpful in the treatment of infants. Parenteral fluids, nutrients, and medicines can be administered over a longer period of time using a peripherally inserted central catheter (PICC) constructed of silicone, polyurethane, or polyethylene. Due to very thin and delicate blood arteries, preterm newborns who are admitted to the hospital typically need a PICC. The three veins that are utilised for PICC catheterization the most frequently are the femoral, subclavian, and internal jugular veins.[2] Infections, catheter thrombosis, extravasation, catheter malposition, broken catheters, pleural effusions, cardiac tamponade, and death are some of the issues that can arise with the placement and use of PICCs. [1] This case study describes a 10-day-old infant who had cardiac tamponade(CT) brought on by a PICC line and was successfully treated with pericardiocentesis.

The case that is being discussed here emphasises the possibility of cardiac tamponade after central line insertion. pericardial

Case Presentation:

A 32-year-old pregnant woman with preterm uterine contractions and vaginal haemorrhage arrived at the obstetric unit at 30 weeks along with her pregnancy. She had undergone corticosteroid medication two days before to being admitted to the hospital and did not disclose any pregnancy issues. She was moved to the operating room for a Cesarean section. Preterm male newborn weighing 1190 g at delivery and with an Apgar score of 7 in the first minute. Following delivery, a physical examination revealed a significant frontal bossing, acrocyanosis, and widespread head, neck, hand, and leg ecchymosis. Resuscitation efforts were started as a result of an increase in his respiratory distress syndrome (RDS) score from 4 to 7 and indicators of respiratory distress. He was then given nasal CPAP, which was later changed to mechanical ventilation in the neonatal intensive care unit (NICU). His O2 saturation, blood pressure, and heart rate improved to > 94%, 70/35 mmHg, and 160 beats per minute, respectively, under mechanical ventilation with synchronised intermittent mandatory ventilation (SIMV) configuration. The right upper extremity's auxiliary vein was used to implant a PICC line for parenteral nutrition, intravenous treatment, and medication delivery on day 3 following NICU admission. A chest X-ray revealed that the PICC line's tip was positioned correctly in the superior vena cava (SVC). After 72 hours in the NICU, mechanical ventilation was stopped due to better respiratory health and regular breathing. Extubation was followed by the continuation of low-flow oxygen therapy and the initiation of low-volume feeding based on his tolerance. His clinical condition improved, including a steady increase in feeding volume and breathing assistance, and his weight gain was adequate. He suddenly experienced hypotonia, apnea, hypoxia, and bradycardia on day 10 after being admitted to the NICU. He was gasping, had low blood pressure, and no peripheral pulses were present. Resuscitation and ventilation assistance were started within minutes of the alarm indications, and inotropic medications were also given. Due to his ongoing serious state (hypertension and shortness of breath), the endotracheal tube was checked for displacement or obstruction despite the mechanical ventilator's high-frequency setup. Around three and four minutes , a number of

medical procedures were started, including nothing by mouth (NPO), high-dose antibiotic therapy, emergency echocardiography, brain ultrasound, arterial and venous blood collection, blood cell counting, and arterial blood gas analysis. 5-7 minutes later, echocardiography was done, and the findings included tamponade, significant pericardial effusion, right atrial collapse, and SVC perforation brought on by the catheter. ASD, pleural effusion, or patent ductus(PDA) arteriosus were not present, and the ejection fraction value was 40%. The PICC was also withdrawn while a peripheral venous catheter was being placed. 10 ml of the pericardial fluid were extracted during an urgent pericardiocentesis using subxiphoid cannulation under the guidance of echocardiography. After testing the aspirated fluid in the lab, it was discovered that there was severe acidosis (pH 6.80) and hyperglycemia. The patient was hydrated with a low glucose solution, and bicarbonate therapy was started in an effort to alleviate the hyperglycemia and metabolic acidosis. The respiratory parameters gradually improved while on mechanical ventilation; concurrently, pericardial drainage and PICC removal was done .O2 saturation rose to 95%, and blood pressure increased.. After pericardial drainage and PICC removal, the neonate's clinical responses dramatically improved, which was suggestive of PICC displacement, pericardial perforation, and cardiac tamponade. Every 12 hours, echocardiography was performed again to make sure there were no new pericardial effusions. The patient was gaining weight and appeared to be in good health on day 40.



Chest X-ray findings showing the tip of the peripherally inserted central catheter line at appropriate position

Discussion:

PICC lines are frequently inserted for parenteral administration in premature newborns. Pericardial effusion(PCE) following PICC installation is an infrequent consequence, despite the fact that PICC lines are linked to a number of catheter-related complications. In the case that is being discussed here, researchers draw attention to the potential risk of pericardial effusion with tamponade, which can be lethal for a newborn one week after PICC insertion. Despite the fact that this complication is infrequent and rare after PICC implantation, the diagnosis was recognised right away in this instance and was confirmed by echocardiography.[2] In accordance to this study, Khoo et al. also detailed three instances of PCE/CT associated with PICC in low birth weight infants, whose prompt detection by echocardiography and pericardiocentesis resulted in successful resuscitation and survival.[3]

Conclusion:

The instance illustrated here highlights the possible risk of cardiac tamponade following central line insertion with abrupt and unanticipated symptoms linked to cardiovascular collapse. It is crucial to ascertain the catheter tip's displacement into the pericardial space and act as soon as possible and to start pericardiocentesis and catheter removal immediately, both of which are efficient methods for preventing fatality. Additionally, all neonatologists should be aware of

this clinical emergency and the necessary actions, and pericardial effusion with tamponade should be suspected in every case with PICC.

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