NU Rounds

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Dear Doctor,

Greetings from Micro Labs limited. We are happy to bring you "NU Rounds" which contains latest and interesting news in the field of Nephrology and Urology.

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Best Regards,

Medical Team, Micro Labs Ltd

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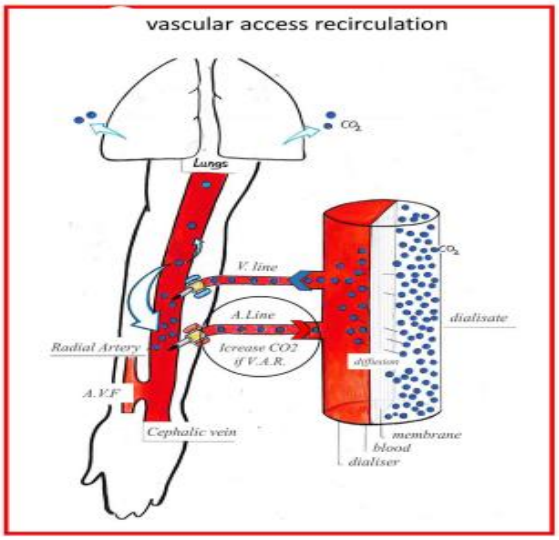
1. A study on evaluating the vascular access recirculation by measuring the partial pressure CO2 change in the dialyzer blood inlet during hemodialysis

Introduction: Hemodialysis vascular access performance has a significant impact on the efficacy and quality of hemodialysis therapy. The arteriovenous fistula (AVF) is the best option for vascular access in terms of dialysis quality. The guidelines advise ongoing vascular access monitoring to detect any changes in the AVF's function, given the significance of the device. During hemodialysis sessions, vascular access recirculation (VAR) involves the direct return of dialyzed blood from the venous to the arterial needle. This is an indication of a decline in intra-access blood flow rate (Qa), which is connected to a decrease in the effectiveness of the dialysis, a decrease in KT/V, and potentially a negative result for the patients.[1] The most widely used approach was the urea-based test, which has since been abandoned because of its high nursing workload requirements, lack of reliability, delayed findings, low precision, and poor reproducibility. Blood gas analysis (BGA) is being used as a novel measure to evaluate VAR. The transfer from the dialysate results in the blood returning from the dialyzer having a much greater carbon dioxide partial pressure (pCO_2) than the blood entering the dialyzer. Therefore, in the presence of VAR, the post-dialyzer "venous" blood with a high pCO_2 enters the extracorporeal circuit through the artery needle rather than returning to the systemic circulation, increasing the value of pCO_2 in the arterial line unnaturally.[2]



The purpose of this study was to assess the utility of pCO_2 as a diagnostic tool for chronic hemodialysis patients with vascular access recirculation.

Methods: In this cross-sectional study, a total of 70 hemodialysis patients were included. This study's main goals were to assess vascular access recirculation using pCO_2 and compare the results to those of the gold-standard urea recirculation test. The difference between the arterial line's pCO_2 at baseline (pCO_2T1) and after five minutes of hemodialysis (pCO_2T2) was used to calculate the value of pCO_2. pCO_2 equals pCO_2T2-pCO_2T1.

Results: The mean pCO_2 was 4 ± 4 mmHg, and the urea recirculation percentage was 7% ± 9%. Both methods revealed vascular access recirculation in the same 17 patients (24% of the population) with a pCO_2 of 10 ± 5 mmHg and a urea recirculation percentage of 21% ± 9%. The main variation between vascular access recirculation and non-vascular access recirculation patients was the duration of hemodialysis months (22 ± 19 vs. 46 ± 36, p: 0.05). The average pCO_2 was 1.9 ± 2 in the non-vascular access recirculation group, and the urea recirculation percentage was 2.8 ± 3. The ΔpCO_2 level was related to the percentage of urea recirculation (R: 0.728; $p < 0.001$). (Figure 1)

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Discussion: This study demonstrates that the RecirCO2lation test is equally accurate as the urea recirculation% test in detecting the presence of pathological AVF recirculation. As a result of the existence of vascular access recirculation, individuals with lower dialysis efficacy are identified by the RecirCO2lation test, which also has a negative correlation with KT/V.[1] According to research by Marano M. et al., measuring pCO_2 during the first five minutes of a hemodialysis session can detect AVF recirculation and an increase in pCO_2 > 4.5 mm Hg from the baseline value, or alternatively, a single value of $pCO_2 \geq 43$ mm Hg after five minutes is indicative of VAR.[2] The quality of life and survival rates of patients receiving chronic hemodialysis depend greatly on good vascular access.[3]

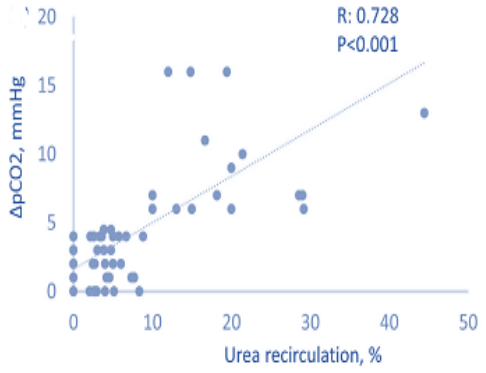

Figure 1: Correlation test of urea recirculation, % with ΔpCO2, mmHg

Conclusion: This study concludes that the RecirCO2lation test successfully detects vascular access recirculation. It is easy to use and doesn't need any preparation or equipment.

During hemodialysis, pCO2 in the arterial blood line is a useful and trusted diagnostic tool for determining recirculation of the vascular access.

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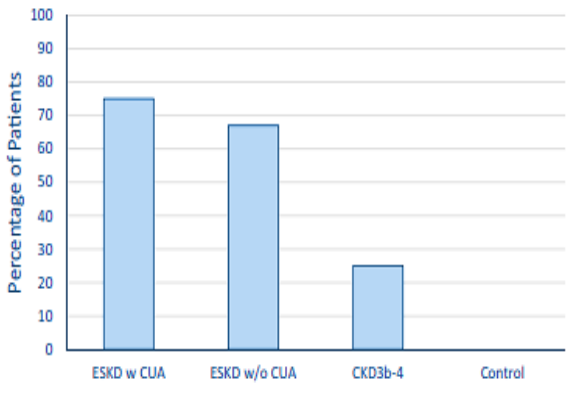
2. Evaluation of cutaneous vascular calcifications in patients with calcific uremic arteriolopathy and chronic kidney disease

Introduction: Calcific uremic arteriolopathy (CUA), also known as calciphylaxis, is an uncommon but potentially fatal disorder that primarily affects people with chronic kidney disease (CKD). Patients often first exhibit somewhat vague cutaneous symptoms, which quickly develop into numerous, excruciatingly painful ischemic lesions. Although the pathophysiology of CUA is poorly understood, it is most likely caused by an imbalance between the factors that promote and prevent calcification.[1] The differential diagnosis of calciphylaxis includes atherosclerosis, cholesterol embolisation, warfarin necrosis, radiation arteritis, vasculitis, cellulitis, purpura fulminans, oxalate vasculopathy, antiphospholipid antibody syndrome, endarteritis obliterans, cardiac myxoma, Martorell hypertensive ischemic ulcer, and, in the early stages, nephrogenic systemic fibrosis (NSF). A history and physical examination, along with a possible histologic study of skin biopsy tissue, are the best ways to distinguish calciphylaxis from the majority of other illnesses.[2] The purpose of this study was to examine the relationship between systemic vascular calcification and the presence of cutaneous calcifications in non-lesional tissue in individuals with chronic renal disease.

Methods: A total of 39 adult patients were separated into four groups in this cross-sectional study. Group A: Calcific uremic arteriolopathy (current or previous) (n = 9); Group B: Chronic kidney disease in its latter stages (n = 12); Group C: Chronic kidney disease in stages 3b–4 (n = 12); Group D: Healthy controls (n = 6). All patients with calcific uremic arteriolopathy had advanced renal disease. The primary objective of this study was to evaluate the presence of cutaneous vascular calcifications in non-lesional skin biopsies from patients with calcific uremic arteriolopathy, both current and past, and patients with various stages of chronic kidney disease without calcific uremic arteriolopathy, as well as their relationship with vascular calcification in other vascular beds. Mammography and a lumbar X-ray were used to investigate the calcification of the systemic arteries.

Results: Cutaneous vascular calcifications were not detected in any of the non-lesional skin punch biopsies. Patients with calcific uremic arteriolopathy (75%) and chronic renal disease (end-stage 67% and stage 3b–4 25%, respectively) had breast arterial calcification. (Figure 1) Abdominal aortic calcium (AAC) scores of 5 indicated that there was evidence of systemic calcification in all CKD patients. Patients with ESKD with CUA, ESKD without CUA, and CKD stages 3b–4 had median AAC scores of 21, 22, and 15, respectively. The median score in the control group was significantly lower (AAC = 1). The propensity for serum calcification varied considerably between the groups.

Figure 1: Breast arterial calcification (BAC) in comparison to other groups



CKD3b-4, chronic kidney disease stage 3b-4 (eGFR 15-44); CUA, calcific uremic arteriolopathy; ESKD, end stage kidney disease (receiving dialysis), w, with; w/o, without.

Discussion: This investigation revealed skin punch biopsies cannot be used in risk stratification or screening for CUA despite a significant burden of systemic vascular calcification, as cutaneous calcium deposits in non-lesional tissue could not be shown histopathologically in patients with chronic kidney disease.[1] Similar to this, Roendbjerg AK et al. reported that patients with various stages of CKD, including CUA, did not have any vascular calcifications in punch biopsies from unaffected skin. Breast arterial calcifications (BAC), AAC, and enhanced calcification propensity by T50 were used to confirm vascular calcification despite imaging. This suggests that skin vascular calcification and, consequently, patients at risk for developing CUA cannot be detected by standard punch biopsies.[3]

Conclusion: This study concludes that despite the existence of systemic vascular calcification, as measured by BAC and AAC, and altered levels of vascular calcification biomarkers, vascular calcifications could not be established in non-lesion skin patients with CKD, particularly CUA. The results confirm that skin punch biopsies cannot be used for CUA risk assessment or screening.

Patients with Calcific uremic arteriolopathy have a lower T50, a higher breast arterial calcifications (BAC), and greater systemic calcification. Skin punch biopsies cannot be used for Calcific uremic arteriolopathy risk assessment or screening

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3. A study on assessing the impact of needle orientation during an arteriovenous access puncture on the duration of time needed for compression after hemodialysis

Introduction: Arteriovenous fistulas (AVF) have become the primary vascular accesses for hemodialysis patients; however, their management after maturation creates major difficulties.[1] Currently, there are two alternative methods for positioning and orienting needles for puncturing native arteriovenous fistulas: One method involves orienting the needle bevel upwards following fistula puncture, rotating it immediately to the bevel-down position, and then commencing extracorporeal blood flow. Another method involves puncturing the fistula while the needle bevel is pointed downward (for example, towards the skin surface). The method employed varies by country as well as by the expertise and culture of a certain dialysis centre. Maintaining a downward bevel on the needle during puncture should have an anatomical benefit when the needle is removed because the vascular flap at the puncture site should raise in response to blood flow and naturally cover the opening made by the needle's insertion.[2] The purpose of this study was to compare the minimal compression time needed for hemostasis following needle removal using these two needle insertion techniques.

Methods: In this prospective, randomised study, a total of 42 patients were included. Patients were divided into bevel-up or bevel-down insertion treatment groups. Using bevel-up access puncture, the typical post-dialysis puncture site compression time for each patient was estimated over a baseline of two weeks. In the following, fistula puncture was performed with needles inserted bevel up or down at each of two consecutive follow-up periods in order to ascertain the shortest post-dialysis puncture-site compression time. The minimal compression time required to prevent bleeding on needle removal was calculated for each follow-up period by gradually reducing the compression time. In addition to pre-pump and venous pressures, the ability to achieve the target blood flow rate throughout the dialysis session was evaluated for puncture-related pain.

Results: During the bevel-up needle insertion period, the mean difference between baseline compression time and the minimum compression time was 0.8 ± 3.7 min, and during the bevel-down needle insertion period, the mean difference in compression time was 1 ± 3.3 min. The time required in each intervention phase to establish the lowest compression time was 26 ± 74 and 21 ± 27 days for the bevel-up and bevel-down periods, respectively. The minimal compression time needed for homeostasis following needle removal was typically 10.8 minutes. The direction of the access needles during arteriovenous fistula puncture had no effect on the patient's pain related to access puncture (p = 0.06) (Table 1). The two insertion strategies did not differ in terms of puncture-related pain, pre-pump or venous pressures, or the capacity to reach the target blood flow rate throughout the dialysis session.

Pain score (ranged from 0 to 10)	Mean	95% CI	*p*-value
Needle bevel down	1.17	[0.86;1.48]	0.060
Needle bevel up	0.95	[0.70;1.19]	

Table 1. Impact of needle placement on pain

Discussion: In this investigation, the direction of the vascular access needle's bevel during insertion had no effect on hemostasis following needle removal or the discomfort felt during puncture.[2] Ozen et al. showed that when a downward bevel approach was used for fistula puncture, the post dialysis compression time after needle removal was decreased.[3]

Conclusion: This study concludes that bevel-up and bevel-down needle orientations for arteriovenous fistula puncture are equal in terms of establishing hemostasis upon needle withdrawal and minimising pain after the puncture.

The orientation of the needle bevel during hemodialysis arteriovenous fistula puncture had no impact on the compression time required for determining hemostasis post dialysis.

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4. A Rare Case on Uretero-Jejunal Fistula

Introduction: Uretero-arterial fistulas are a rare disorder that can be fatal if bleeding occurs. The diagnosis is quite challenging because these bleeds appear and disappear.[1] As a rare consequence of peptic ulcer illness, uretero-enteric fistulas are frequently linked to recurring and/or chronic urinary tract infections. They make up around 1% of fistulas in the urinary system. The most frequent causes are radiation therapy, malignancies, chronic kidney transplant rejection, ischemia, traumatic injury, chronic inflammatory bowel disease, and complex diverticulitis. Different parts of the small bowel can be affected depending on their location.[2]

In this case, a patient with a history of gastrojejunostomy for superior mesenteric artery (SMA) syndrome experienced an uncommon complication of the uretero-jejunal fistula.

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Case Presentation: A 41-year-old female patient was admitted to the hospital with the main complaints of nausea, vomiting, poor oral intake, and weight loss of 40 pounds during the previous few months. The patient previously underwent chemotherapy and radiation therapy for cervical cancer, which was worsened by a rectovaginal fistula that required an end colostomy with a Hartmann pouch more than ten years ago. There were no indications of recurring malignancy on an abdominal and pelvic computed tomography (CT) scan with intravenous (IV) contrast. The patient was identified as having SMA syndrome because the test revealed dilatation of the proximal duodenum and stomach at the level of the transverse duodenum, where it crosses the aorta and the SMA.

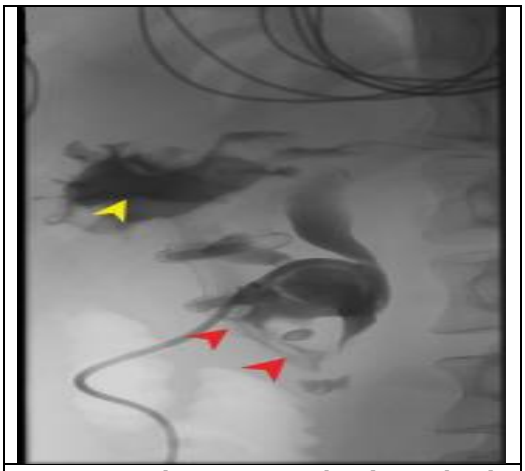

Figure 1: Nephrostogram with red arrowheads indicating the passage of contrast from the proximal left ureter to the AXIOS stent and a yellow arrowhead indicating the stomach

The patient opposed the insertion of a naso-jejunal tube. Finally, a gastrojejunostomy with the implantation of a lumen-apposing metal stent (LAMS) AXIOS TM (Boston Scientific, Natick, MA) under endoscopic ultrasonography (EUS) guidance was performed. A month later, the patient appeared with left-sided flank pain along with a fever and chills. Patient leukocyte levels are increasing, and urine analysis revealed a urinary tract infection. A CT of the abdomen and pelvis with IV contrast revealed patchy perfusion of the left kidney's parenchyma, interval development of left-sided hydronephrosis, and blockage of the proximal left ureter due to abnormally enlarged left periaortic lymph nodes. Then, the small bowel distal to the Treitz ligament and the larger curvature of the stomach were separated by the AXIOS TM stent.

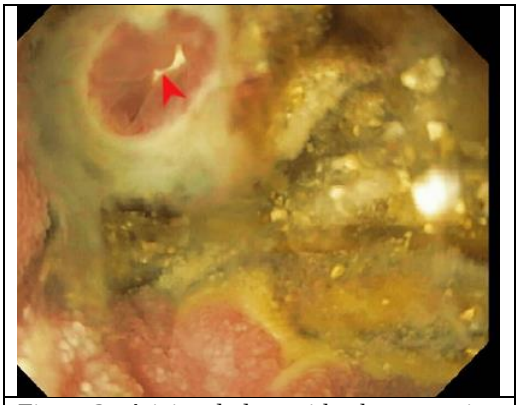

Figure 2: A jejunal ulcer with a base opening is visible on an EGD (red arrowhead).

The patient underwent left-sided nephrostomy tube placement by interventional radiology (IR) after being hospitalised for the treatment of left-sided pyelonephritis and being started on IV ceftriaxone. However, the patient had nephro-ureteral catheter implantation by IR due to worries about leakage from the proximal left ureter. A nephrostogram was acquired during the procedure and revealed a flow of contrast from the left proximal ureter to the stomach and AXIOS TM stent (Figure 1). Esophagogastroduodenoscopy (EGD) revealed many superficial erosions and a jejunal ulcer with an opening at the base in the patient (Figure 2). A white ureteral stent could be seen through the ulcer base

Figure 3: A white ureteral stent was seen through the ulcer base on an endoscopic picture taken during an EGD (red arrowhead).

while a ball-tip catheter was used to evaluate the mucosal aperture during the endoscopic operation (Figure 3).

The LAMS stent was taken out during the endoscopic surgery, and a percutaneous endoscopic gastrojejunostomy (PEG-J) tube was inserted to provide nutrition away from the ulcer location. After beginning tube feeding the following day and continuing with high-dose acid suppression for an additional 14 days, Pateint was well tolerated and discharged. After six months, a follow-up EGD revealed endoscopic indications of ulcer healing. Monitoring positron emission tomography (PET) scan revealed no signs of an illness that was metabolically active.

Discussion: In this study, a patient was admitted for treatment of left-sided pyelonephritis, began on IV ceftriaxone, and underwent interventional radiology (IR) for the installation of a left-sided nephrostomy tube.[2] According to a study by Kurata S. et al., the uretero-arterial fistula was brought on by the prolonged use of an indwelling stent, chemotherapy and radiotherapy, infection, and an expansion of the lesion. A complicated fistula between the right internal iliac artery and the right distal ureter was discovered using contrast CT. Additionally, the tumour allowed contrast media to enter the digestive system. Because she presented with acute pyelonephritis due to ureteral blockage, a right nephrostomy was done.[3]

Conclusions: Clinicians should constantly take the probability of this uncommon but possibly fatal consequence into account when caring for patients with complicated medical conditions. Uretero-enteric fistulas can now be successfully detected and treated with the help of widely accessible endoscopic and radiologic methods.

Endoscopic and radiologic procedures are now readily accessible for detecting and treating uretero-enteric fistulas.

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