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Artigo Científico / *Scientific Article*

Ultrassonografia de hidronefrose e líquido perinéfrico no pré-hospitalar e seguimento clínico

Pre-hospital and follow-up ultrasound detection of hydronephrosis and perinephric fluid

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Resumo

A ultrassonografia de triagem é essencial nos serviços de emergência, proporcionando uma ferramenta rápida e precisa para detetar patologias associadas à cólica renal, como hidronefrose ou obstrução urinária. Sua portabilidade, capacidade de gerar imagens em tempo real e a ausência de radiação, tornam ideal para ambientes com recursos limitados, como serviços básicos de urgência periféricos em Portugal, onde o caso descrito ocorreu.

O uso da ultrassonografia de triagem por profissionais treinados através de ensino teórico e prático universitário permite uma resposta imediata a questões clínicas em contextos de emergência. Este artigo enfatiza a importância da ultrassonografia na avaliação inicial de pacientes com cólica renal e suspeita de hidronefrose e ou obstrução urinária, auxiliando nas decisões sobre tratamento e encaminhamento às especialidades.

Neste estudo, um paciente foi admitido em um serviço básico de emergência periférico com sintomas de cólica renal. A ultrassonografia inicial revelou dilatação pielocalicial discreta e líquido perirrenal, com permeabilidade bilateral dos jatos urinários mantida. Com base nesses resultados, iniciou-se tratamento conservador com medicação analgésica. À medida que o paciente melhorava, foi decidido continuar o acompanhamento com ultrassonografia ambulatória. No terceiro dia, o líquido perirrenal já não era visível e o grau de dilatação pielocalicial diminuiu. No sétimo dia, não havia sinais de dilatação pielocalicial ou líquido perirrenal, e o paciente manteve-se assintomático.

Abstract

Screening ultrasound is essential in emergency services, providing a fast and accurate tool for detecting pathologies associated with renal colic like hydronephrosis or urinary obstruction. Its portability, real-time imaging, and lack of radiation make it ideal for environments with limited resources, such as peripheral basic emergency services in Portugal, where the described case occurred.

The use of screening ultrasound by trained professionals based on theoretical and practical teaching enables an immediate response to clinical questions in emergency contexts. This article emphasizes the importance of ultrasound in the initial assessment of patients with renal colic and suspected hydronephrosis/urinary obstruction, aiding decisions regarding treatment and referral to specialists.

In this study, a patient was admitted to a basic peripheral emergency service with symptoms of renal colic. The initial ultrasound revealed discrete hydronephrosis and perirenal fluid, with bilateral patency of the urinary jets. Based on these results, conservative treatment with pain relief medication was initiated. As the patient improved, the physician decided to continue monitoring the patient with follow-up ultrasounds on an outpatient basis here, imaging improvements were observed. By the third day, perirenal fluid was no longer visible, the degree of pelvicalyceal dilation had decreased, and the patient was asymptomatic. By the seventh day, there were no signs of pelvicalyceal dilation or perirenal fluid, and the patient remained asymptomatic.

A ultrassonografia de triagem contribui para a segurança do paciente, permitindo a deteção precoce de patologias urinárias e reduzindo a sobrecarga dos hospitais centrais ao direcionar casos mais simples para acompanhamento ambulatório supervisionado ecográfica e clinicamente.

Palavras-chave: Hidronefrose, Patência, Perinefrítico, Triagem, Ultrassom.

Screening ultrasound contributes to patient safety by enabling early detection of urinary pathologies and reducing the burden on central hospitals by redirecting simpler cases that can be managed on an outpatient basis with appropriate follow-up, thereby avoiding risks to the patients.

Keywords: Hydronephrosis, Outpatient, Pyelocaliceal, Perinephric, Screening, Ultrasound.

Introduction:

Ultrasonography is a highly recommended tool for evaluating suspected renal colic (1,2). It helps confirm or exclude pathologies and addresses key questions such as whether an examination is normal, abnormal, or inconclusive, detecting hydronephrosis, urinary obstruction and suspicious mass (3). It also enables correlation of imaging findings with the patient's clinical status during evaluation (4).

In specific scenarios, ultrasonography plays a role in interventional procedures, such as assessing bladder distension in anuria or assisting in complex urinary catheter placements (5,6). Its utility in emergency settings is particularly significant, enabling rapid and accurate clinical decisions, facilitating referrals, and supporting specialized care (7). The widespread availability of ultrasound devices and expanded emergency protocols have broadened its use across multiple medical specialties (8).

While invaluable, renal ultrasonography must complement the expertise of nephrology, urology, or radiology specialists. Diagnostic accuracy depends on operator training, as non-specialists face pitfalls when interpreting results (9–11). Adherence to defined protocols ensures precision and maintains professional boundaries (12). Moreover, continuous education and ongoing training in ultrasonography play a vital role in maintaining high standards of diagnostic practice (13). In many settings, sonographers also perform ultrasound scans (14) and should follow equally demanding standards, but aimed at specific protocols in cases of intervention in emergency services.

Scientific evidence underscores the benefits of point-of-care ultrasound (POCUS) in suspected renal colic, especially in emergency settings(15,16). Early use of POCUS has been linked to shorter hospital stays and reduced emergency visits in acute kidney disease cases(17,18). Renal colic, often caused by upper urinary tract stones, is a frequent condition in emergency departments, presenting a significant health burden with high recurrence rates (19). Ultrasonography is particularly effective in detecting hydronephrosis(20), a key indicator of urinary obstruction in the renal pelvis or ureter. Similarly, the detection of perinephric fluid is a common finding, underscoring the importance of renal POCUS operators being prepared to make informed decisions and take appropriate actions when encountering such cases.

Perinephric fluid is caused by the rupture of the collecting system due to the downstream flow of urine obstructed within the urinary tract, resulting in leakage from the kidney. The area most susceptible to rupture in the collecting system is the renal fornix, located at the apex of the minor calyces. Urine typically appears as an anechoic band surrounding the kidney(21).

Although the international literature remains inconclusive regarding the clinical approach to perirenal fluid, it is considered a more significant and clinically valuable finding when renal colic is accompanied by hydronephrosis and urinary tract obstruction(22). This topic will be further explored in the discussion chapter.

In basic emergency services (BES), particularly in peripheral areas lacking advanced imaging like CT(gold standard), and detailed renal functional laboratorial analysis, ultrasonography becomes indispensable (23). Provisional ultrasound reports enable effective management and timely referral, bridging gaps in diagnostic resources (24), and promoting responsible technology use (25).

Case Description:

A 37-year-old man sought assistance at a BES, with symptoms compatible with renal colic. During the Manchester Triage(yellow), the patient presented with abdominal pain radiating to the back, persistent in nature, along with severe nausea. The patient was afebrile, with a blood pressure reading of 140/90 mmHg. On a pain scale of (0 -10), the patient rated their pain as a 6. A simple urine test performed by the nurse revealed 3 crosses of blood, 2 crosses of protein, with all other values unchanged. During the medical examination, the abdomen was found to be soft and depressible, with no signs of peritonism, masses, or adenomegaly. A renal Murphy's sign on the right side was considered doubtful. The patient began pain management therapy, and the physician requested a renal screening ultrasound. The resumed ultrasound is displayed in **Figure 1**; the examination revealed mild pyelocaliceal dilation in the right kidney, along with a small amount of perinephric fluid near the lower pole of the right kidney. The left kidney showed no alterations detectable by ultrasound. The bladder appeared normal, with bilateral patency of urinary jets.

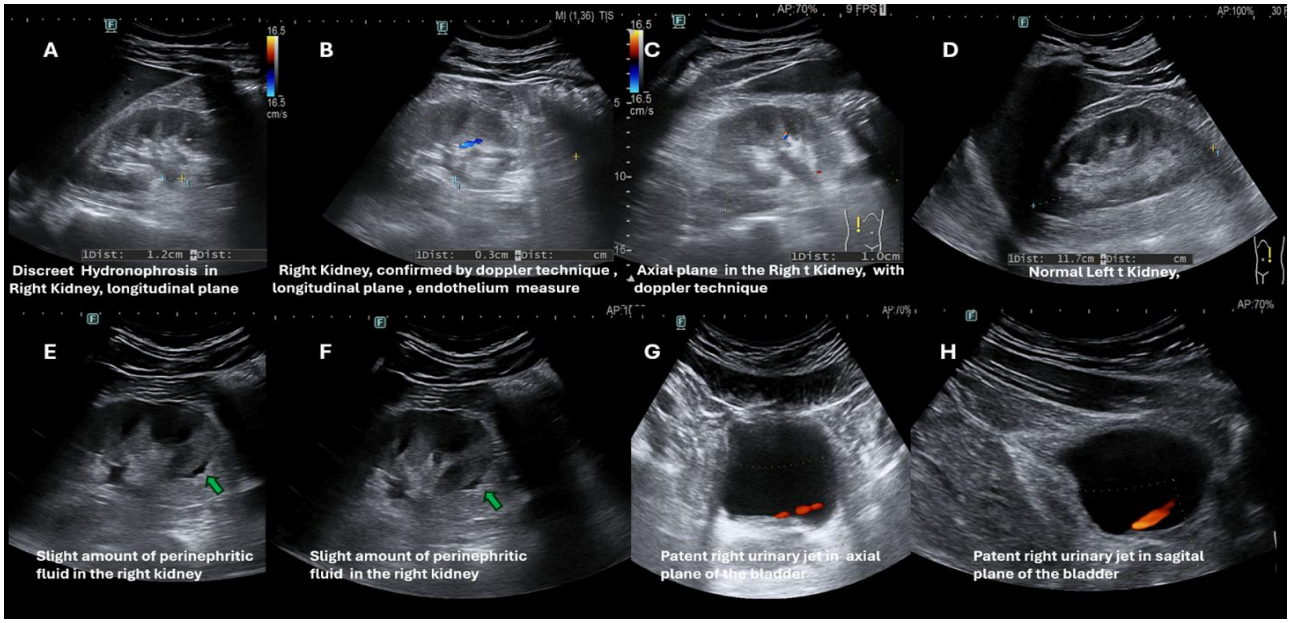

Figure 1 - Represents 6 images belonging to the first renal screening ultrasound.

A-Discreet hydronephrosis in right kidney in longitudinal plane measurement of the pyeloureteral junction with 1.2 cm). **B**-Right kidney hydronephrosis confirmed by doppler technique in longitudinal plane. **C**-Endothelium measurement in axial plane at the right kidney, accompanied. by doppler technique. **D**-Normal left kidney. **E**-Slight amount of perinephritic fluid in the right kidney. **D**-Slight amount of perinephritic fluid in the right kidney. **E**-Patent right urinary jet in axial plane of the bladder. **F**-Patent right urinary jet in sagital plane of the bladder.

The patient showed significant improvement following the completion of therapeutic measures for pain management. At the time, there was no evidence of obstruction in the urinary outflow tract to the bladder, no apparent large calculi visible, and only mild pyelocaliceal distension was observed. Based on these findings, the decision was made to discharge the patient home, with clear instructions to return to the Emergency Department (ED) should the clinical condition worsen.

The patient was advised to follow up at the ED on an outpatient basis for monitoring of the pyelocaliceal distension /hydronephrosis and perirenal fluid, even in the absence of pain. The patient accepted this plan and resumed their daily routine. Three days after the initial episode, the patient underwent a follow-up ultrasound, the findings of which are summarized in **Figure 2.** These revealed the absence of perirenal fluid and a reduction in the degree of pyelocaliceal distension.

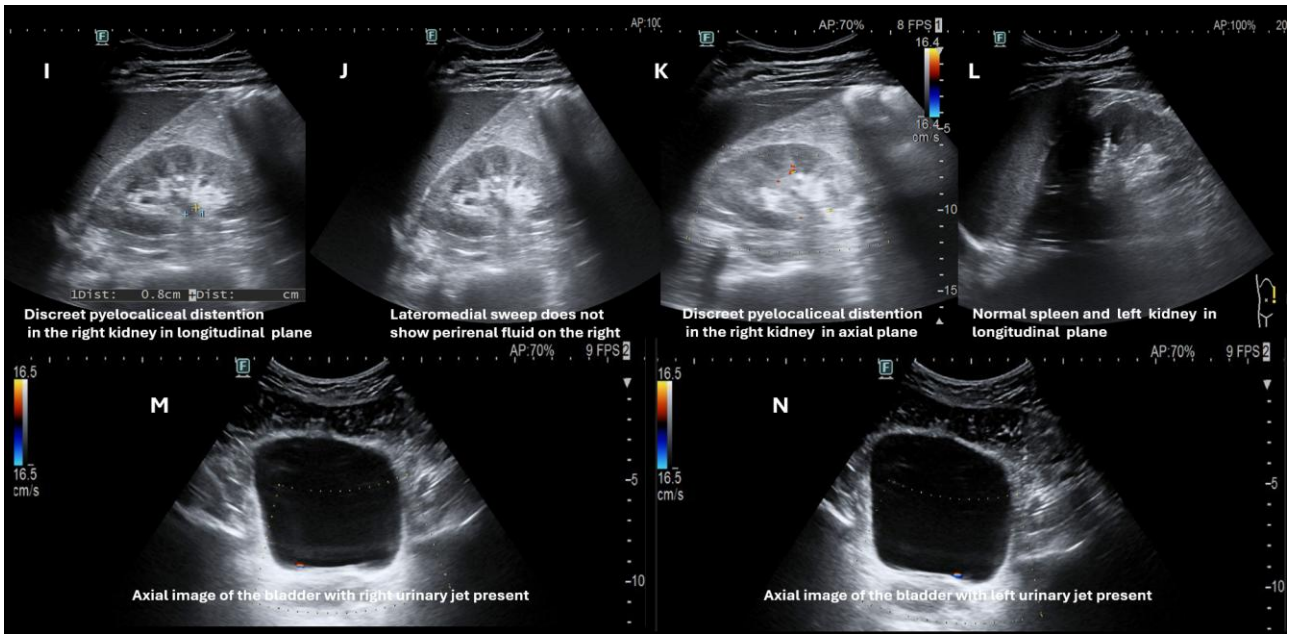

Figure 2 - Represents 6 images belonging to the second renal screening ultrasound.

I-Discreet pyelocaliceal distention in the right kidney in longitudinal plane (measurement of the pyeloureteral junction with 0.8 cm) **J**-Lateromedial sweep does not show perirenal fluid on the right. **K**-Discreet pyelocaliceal distention in the right kidney in axial plane. **M**-Normal spleen and left kidney in longitudinal plane.
N-Axial image of the bladder with right urinary jet present. **O**-Axial image of the bladder with left urinary jet present

Four days later, the patient returned for a follow-up visit, during which they remained asymptomatic. A control ultrasound was performed again, as resumed in **Figure 3,** demonstrating complete normalization of the renal ultrasound findings, here pyelocaliceal dilatation is no longer present.

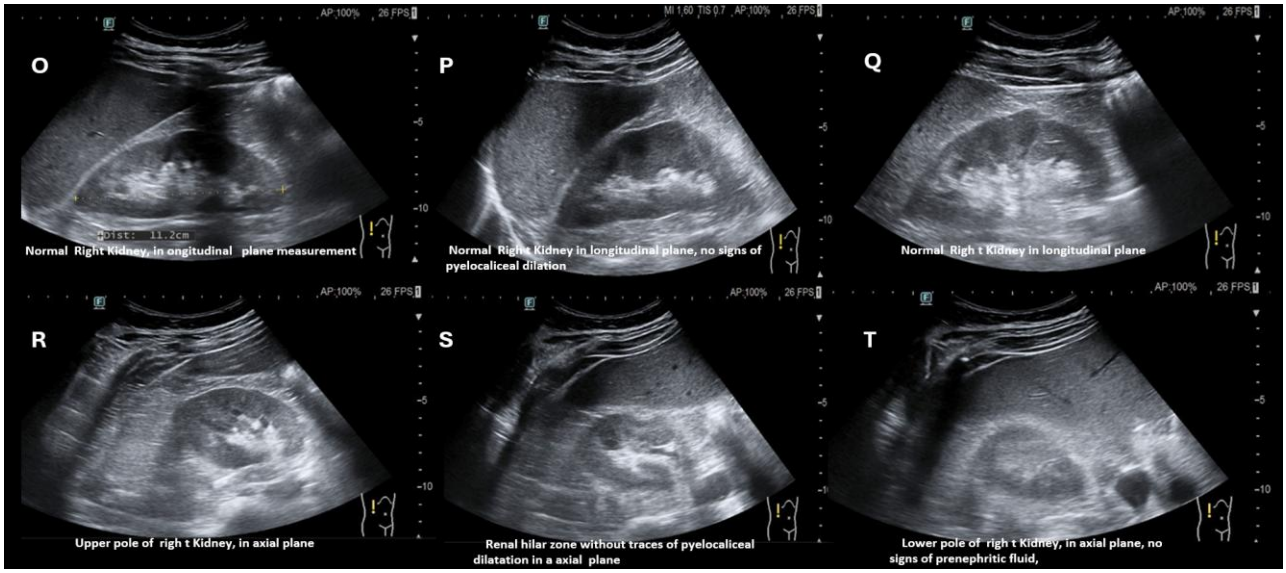

Figure 3 - Represents 6 images belonging to the third renal screening ultrasound.

O, P, Q - Lateromedial sweep in the right kidney does not show any signs of pielocalicial dilation, in **O** is present normal measurement(11.2cm), of the right kidney. **R**-Upper pole of right t Kidney, in axial plane. **S**-Renal hilar zone without traces of pyelocaliceal dilatation in a axial plane. **S**-Lower pole of right t Kidney, in axial plane, no signs of perinephritic fluid.

Discussion

Literature suggests that the presence of perinephric fluid is associated with more severe pain in clinical presentations of renal colic and is often linked to obstructive states with clinical impact(26). Conversely, evidence indicates that the majority of hydronephrosis caused by typical calculi resolves spontaneously(27–30). Some studies have highlighted a relationship between the size and anatomical location (upper or lower urinary tract) of calculi and the likelihood of spontaneous resolution without the need for specialized medical intervention(31). This apparent dichotomy can leave non-specialist physicians uncertain about the most appropriate course of action.

In this case, although a more cautious approach by a non-specialist physician might initially suggest referring the patient to a central hospital, considering that detailed laboratory analyses of renal function cannot be performed in the BES. Although there were no signs of urinary flow obstruction on the side of the pyelocaliceal distension/hydronephrosis, patient's pain was effectively managed with the initial dose of analgesic medication, and no calculi of significant size were detected. Consequently, a decision was made, in agreement with the patient, to proceed with recovery and outpatient follow-up using sequential sonographic evaluations over the following days.

The follow-up ultrasound sequence was not pre-scheduled, as the patient resumed daily work activities and returned for evaluation at the earliest opportunity. On the third day, a repeat ultrasound was performed, revealing no signs of perinephric fluid and the degree of pyelocaliceal distension was much lower. By the seventh day, the final assessment showed complete resolution, with no evidence of pyelocaliceal distension. Notably, the clinical decision was also supported by the patient's high level of health literacy(32), which enabled the attending physician to effectively communicate the importance of seeking emergency care should any signs of clinical deterioration occur.

We believe it is important for the operator performing the screening ultrasound to have a clear understanding and visual awareness not only of the behaviour of pyelocaliceal dilation but also of the patterns of deposition that may occur with small amounts of perirenal fluid. Therefore, we have included a **Video 1** with images captured on first day our patient was admitted in the BES.

Conclusion

Trained sonographers skilled in emergency ultrasonography play a critical role, particularly in settings far from central hospitals where access to specialized medical care is limited. Their expertise ensures prompt and accurate detection of conditions like hydronephrosis and perirenal fluid accumulation, which are essential in the initial management of suspected renal colic.

Further research is needed to confirm whether clinical teams with radiology technicians trained in emergency ultrasonography deliver better outcomes than those without in the same institution. Skilled technicians may improve diagnostic accuracy, decision-making, and overall care, which is vital for efficient healthcare systems like the NHS.The inclusion of such personnel in emergency services improves diagnostic accuracy, optimizes resource use, and safeguards patient well-being. In systems like the NHS, integrating protocols and training in point-of-care ultrasonography promotes collaboration and excellence, solidifying its role in managing renal colic and related conditions.

ETHICS STATEMENT

All examinations in this study were requested by the attending physician, either in the Basic Emergency Service or during outpatient follow-up. No personal or institutional data was collected, ensuring full compliance with general data protection regulations. Patient was informed about the study's purpose and gave explicit consent to participate, as documented in the signed informed consent form included in Appendix 1. The main goal was to highlight the practicality and effectiveness of the screening ultrasound technique, particularly in remote settings. The research adhered to ethical guidelines for scientific studies, including the principles outlined in the Helsinki Declaration and applicable national data protection laws.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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