Volume 06, Issue 05 (September-October 2023), PP 167-170 **www.ijmsdr.org**
ISSN: 2581-902X

International Journal of Medical Science and Dental Research

Renal Artery Pseudoaneurysm after Extracorporeal Shockwave Lithotripsy- Literature Review

Fernando Terziotti[1], Daniel Crippa Da Silva[2], Paulo Mazzo Calzavara[3], Andressa Nabhan[4]

[1](*Master's degree from the State University of Londrina, Brazil*
[2](*Resident in Urology at the Evangelical Hospital of Londrina, Brazil)*
[3](Medical student at the institution PUCPR – Londrina, Brazil)
[4] (Medical student at the institution PUCPR – Londrina, Brazil)

Abstract: Extracorporeal shock wave lithotripsy (ESWL) is a very effective treatment for kidney stones, although not free of complications. PAARs are rare vascular complications, little described in the literature, present in less than 1% of patients with hematoma after ESWL. Rupture of the PAAR has a high mortality rate and its management must be carefully elaborated. The diagnosis of this vascular lesion is a challenge, since the clinical and laboratory manifestations are not specific and may require additional tests. In this study, we reviewed the current literature relating PAAR after ESWL.

Keywords - *Aneurysm, False; Conservative Treatment; Extracorporeal shock wave lithotripsy; Renal Artery*

I. INTRODUCTION

Extracorporeal Shock Wave Lithotripsy (ESWL) is a highly effective treatment for kidney stones; however, it is not without complications. Renal Artery Pseudoaneurysm (RAPA) is a rare complication of this procedure, sparsely documented in the literature and capable of progressing to bleeding and even death. In this study, we conducted a literature review on the association between RAPA and ESWL, utilizing data from PubMed and SciELO from 1998 to 2023. The current literature offers limited information on this topic, and further prospective studies are needed for a better understanding.

II. METHODOLOGY

A comprehensive review of existing literature was conducted on PubMed (http://www.pubmed.gov) and SciELO (https://scielo.org/) between 1998 and June 2023, using various combinations of the following English terms: "False Aneurysm," "Renal Artery," "Conservative Treatment," "pseudoaneurysm," and "Extracorporeal shock wave lithotripsy."

III. RESULTS

From this search, we selected 10 case reports and case series. No randomized clinical trials on this topic were found. Much of the information on this topic is derived from reports related to pseudoaneurysms in other arteries (mesenteric, iliac) and renal hematoma post-ESWL. RAPAs are rare vascular complications, occurring in less than 1% of patients with hematoma after ESWL [1,2]. The exact formation mechanism of these pseudoaneurysms is not fully understood, but it is believed to be related to repeated shockwaves in the presence of pre-existing arterial atherosclerosis [3]. Other risk factors for renal injury include hypertension and patient age [4–6]. RAPA complications include thromboembolism, impaired renal function, fistulas (arterial, venous, enteric, or urinary), infection, neurovascular compression, and even rupture [2]. Diagnosis is challenging, as clinical presentation is not highly suggestive, making angiography the gold standard [2,7,8]. Treatment options vary in the literature, ranging from conservative management to radiological embolization, with success rates exceeding 86% in some cases [2,8]. Ruptured RAPAs have high mortality rates, and their management requires careful consideration, including endovascular and conventional surgical approaches [2,8].

IV. DISCUSSION

ESWL was first described by Chaussy 40 years ago and is still accepted as a non-invasive technique for treating patients with proximal renal or ureteral stones [5]. Stones smaller than 2 cm have an 85% resolution rate, while stones larger than 2 cm have a 65% resolution rate [9].

The most frequent complication of ESWL is ureteral obstruction by fragments during the procedure, which can lead to renal colic, pyelonephritis, or hydronephrosis. In less than 1% of cases, the procedure can result in renal parenchymal injuries, leading to perirenal or subcapsular hematomas [1]. Patients with coagulopathies, uncontrolled hypertension, diabetes, coronary artery disease, and obesity are at a higher risk of renal injury [5,6]. In Dhar's study, patient age was a significant risk factor, increasing the chance of hematoma by 1.67 times every 10 years, with $p=0.009$ [4].

RAPAs are rare and poorly described vascular complications [2], typically associated with iatrogenic causes [8].

Pseudoaneurysms consist of a pulsatile hematoma communicating with an artery through a defect in the arterial wall. Unlike a true aneurysm, which has vessel wall components, a pseudoaneurysm forms a neck that connects the artery to one or more cavities, resulting in systolic flow into the cavity and diastolic flow into the artery [2]. It appears as a well-defined contrast accumulation with thickened walls, resembling high-density arteries [8].

RAPA symptoms are not highly specific and can include flank pain, frank hematuria, hypertension, and a palpable abdominal mass [2,7,8]. Moreover, patients can experience worsened renal function, anuria, and the need for dialysis [2,8]. However, not all patients exhibit these symptoms, and some RAPAs can remain asymptomatic for extended periods, potentially developing spontaneous thromboembolism, as previously described in the literature [7,8].

Generally, the time between pseudoaneurysm formation and clinical manifestation ranges from 2 to 36 days, with our patient being seen in the emergency department on the same day following ESWL [8].

Diagnosing this vascular lesion is challenging, as clinical and laboratory manifestations are nonspecific and may necessitate additional tests. Color Doppler ultrasound (CDUS) is opportune, as it is cost-effective, does not require contrast, and can be highly sensitive and specific when performed by an experienced professional [2,7,8]. Contrast-enhanced imaging reveals the characteristic "yin-yang" sign of the pseudoaneurysm, indicating the direction of blood flow within the lesion [8]. CT can provide an image of the entire urinary tract, being the preferred technique for patient follow-up. However, it requires nephrotoxic contrast to better visualize the RAPA in the arterial phase, which can be a disadvantage when the kidney is already compromised [2,7]. Magnetic resonance imaging does not use nephrotoxic contrast and offers good diagnostic accuracy, but it is costly, and not all hospital facilities have the necessary equipment [2]. Angiography is the gold standard for detecting, anatomically locating, and managing RAPA endovascularly [2,7,8]—embolization achieves up to a 90% success rate but is an expensive, invasive procedure that uses nephrotoxic contrast [2].

RAPA complications include thromboembolism, arterioenteric fistulas, infection, ruptured pseudoaneurysms, and neurovascular compression. Although the risk of pseudoaneurysm rupture is low, it is associated with a mortality rate exceeding 80% [2].

RAPA management can be surgical or conservative depending on the patient's clinical condition. Most cases employ conservative treatment, especially when patients are hemodynamically stable and have small pseudoaneurysms—however, some articles demonstrate the effectiveness of therapy for aneurysms up to 10 cm [2]. When patients present with severe hemorrhagic complications, pseudoaneurysms larger than 2 cm, and renovascular hypertension, surgical treatment may be indicated [2].

Initial surgical treatments involved exploration and nephrectomy. However, with technological advancements, radiological intervention techniques have allowed catheterization [8]. Minimally invasive interventions such as stent placement are now a reality in PAR treatment, resulting in rapid hemostasis and a higher potential for preserving renal function [8].

V. CONCLUSION

Extracorporeal Shock Wave Lithotripsy (ESWL) is a highly effective treatment for kidney stones, but it is not without complications. Renal Artery Pseudoaneurysm (RAPA) is a rare and underreported complication of this procedure, which can progress to bleeding and even death. RAPAs are rare complications of ESWL, potentially fatal when overlooked. Further prospective studies are needed to gain a better understanding of this topic.

Acknowledgements

6.1 Funding

This study did not receive financial support from external sources.

6.2 Conflicts of interest disclosure

The authors declare no competing interests relevant to the content of this study.

6.3 Authors' contributions

All the authors declare that they have made substantial contributions to the conception, design, acquisition, analysis, or interpretation of data; and have been involved in drafting the work or revising it critically for important intellectual content; and have approved the version to be published.

6.4 Availability of data and responsibility for the results

All the authors declare that they have had full access to the available data, and they assume full responsibility for the integrity of these results.

REFERENCES

[1] Mazzucchi E, Berto FCG, Denstedt J, Danilovic A, Batagello CA, Torricelli FCM, et al. Treatment of renal lower pole stones: an update. Int Braz j Urol 2022;48:165–74. https://doi.org/10.1590/s1677-5538.ibju.2020.1023.

[2] Roman LI, Feel CF, França VT, Merten CM, Dummer CD. Renal artery pseudoaneurysm. Jornal Brasileiro de Nefrologia 2017;39. https://doi.org/10.5935/0101-2800.20170080.

[3] Yan S-L, Wu H-S, Chou D-A, Kuo C-L, Huang H-T, Lee Y-T, et al. Pseudoaneurysm of Superior Mesentery Artery Branch After Renal Extracorporeal Shock Wave Lithotripsy: Case Report and Review. Journal of Trauma: Injury, Infection & Critical Care 2007;62:770–4. https://doi.org/10.1097/01.ta.0000245036.68397.1d.

[4] Dhar NB, Thornton J, Karafa MT, Streem SB. A MULTIVARIATE ANALYSIS OF RISK FACTORS ASSOCIATED WITH SUBCAPSULAR HEMATOMA FORMATION FOLLOWING ELECTROMAGNETIC SHOCK WAVE LITHOTRIPSY. Journal of Urology 2004;172:2271–4. https://doi.org/10.1097/01.ju.0000143459.03836.2d.

[5] Labanaris AP, Kühn R, Schott GE, Zugor V. Perirenal Hematomas Induced by Extracorporeal Shock Wave Lithotripsy (ESWL). Therapeutic Management. The Scientific World JOURNAL 2007;7:1563–6. https://doi.org/10.1100/tsw.2007.236.
[6] Newman LH, Saltzman B. Identifying risk factors in developmentof clinically significant post-shock-wave lithotripsy subcapsular hematomas. Urology 1991;38:35–8. https://doi.org/10.1016/0090-4295(91)80009-V.
[7] Santos VGD, Palacios VH, Álvarez CG, Delgado O, Nicolás VD, Álvaro SJ, et al. COMPLICACIONES VASCULARES DEL TRASPLANTE RENAL. DIAGNÓSTICO Y TRATAMIENTO. Archivos Españoles de Urología 2021;74:1013–28.
[8] Yamacake KGR, Lucon M, Lucon AM, Mesquita JLB, Srougi M. Renal artery pseudoaneurysm after blunt renal trauma: report on three cases and review of the literature. Sao Paulo Med J 2013;131:356–62. https://doi.org/10.1590/1516-3180.2013.1315488.
[9] Snicorius M, Bakavicius A, Cekauskas A, Miglinas M, Platkevicius G, Zelvys A. Factors influencing extracorporeal shock wave lithotripsy efficiency for optimal patient selection. Wiitm 2021;16:409–16. https://doi.org/10.5114/wiitm.2021.103915.