Case study

The Resolution of Hypertension afterAdrenalectomy in Patient with Aldosterone-ProducingAdenoma

Abstract

A 52-year-old patient from Bangladesh, known for hypertension for the last year, was taking oralantihypertensives. Nonetheless, he still had uncontrolled blood pressure, and no associated symptoms. Thepatient was referred to Emergency with a presenting complaint of high blood pressure, and highaldosterone and low renin levels. Therefore, a subsequent work-up plan was recommended forhim.

Asperthelabreports,thepatientwasfoundtobesufferingfromprimaryaldosteronism. This was concluded by looking at his lab values, which were seen to be as follows: Aldosterone: 320 ng/L, Renin: 2.55 ng/L, Potassium: 5.2 mmol/L.AnMRIofthe adrenal gland wasorderedforthis patient,both with and without contrast. The findings of the MRI were consistent with left adrenaladenoma. Anapproximately 14 x10.4 x 10.8 mm, oblong-shaped focal lesion, along the maximum TS, AP, and CCdimensions was appreciated.This lesion was implicating the inferior portion of the left adrenal gland laterallimb, and exhibiting low to intermediate signal intensity on all provided sequences with signaldropout on out of the phase sequence. Moreover, minimal peripheral contrast enhancement wasnotedinthepost-contrast administration images.

This led to a prompt referral to the surgery department where the patient was evaluatedand,withina week,operated on for the tumorsuccessfully.

Thispaperdealswiththeevaluation,diagnosis,andpostoperativemanagementofthispatientwhoarrived at the hospital with no suspicion of the tumor that he had in his adrenal glands. Finally, italso summarizes the post-operative symptoms experienced by the patient and how they weremanagedonthe spotto prevent any ensuing complications.

Keywords: PrimaryAldosteronism,Hypertension, AdrenalGlands

INTRODUCTION

Theadrenalglandsor‘suprarenalglands’aresmallyethighlyimportant,triangularglandsthatarepart of the endocrine system. They are located at the top of each kidney and are found to play animportantroleinthefightorflightsystemofanindividualastheyworktoreducestresshormonesunder the appropriate stimulus to help the body deal with several pressurized conditions. Apartfromthis,theadrenalglandsalsosecreteotherhormonesthatareinvolvedintheregulationofthebody’smetabolism,water and saltbalance, andimmunity building.[1]

It is because of these important and dependent roles that the normal functioning of the adrenalglands is considered necessary. However, there are several benign lesions that may occur inrelation to the adrenal glands and which can then alter their normal functioning. In the long term,these lesions may cause unwanted symptoms in the body of the affected individual, thus raisingsuspicionsthat require proper evaluation to beremedied. [2]

Any pathologies that arise within the adrenal glands firstly give rise to endocrine hypertension.Since a patient might already be suffering from primary, or ‘essential’, hypertension, it is called‘secondary hypertension’ when the hypertension is documented to arise secondarily to an adrenalglandpathology.

Themerepresenceofhypertensioninapatientmightmakeitdifficultforthemtobediagnosedorevaluated for an adrenal gland disorder since hypertension is commonly diagnosed in patients.However, there are several other symptoms that differentiate the root causes of hypertension. Inmost cases of secondaryhypertension,primary aldosteronism is thecause.[3][9][10]

This patient mimicked this exact scenario. He had no initial complaint except for uncontrolledblood pressure, which is often seen in patients who have are later diagnosed with this problem. Itwasonlyamatterofa timely and acutediagnosisthatconvincedthedoctorsthattheadrenalglandswere

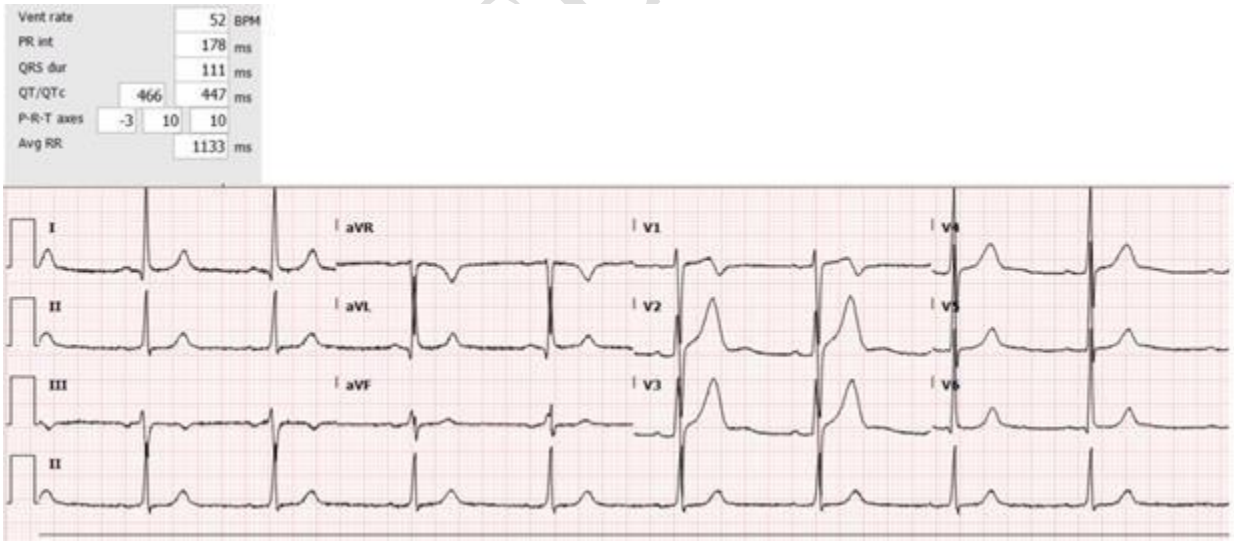
involvedinthiscase.Asaresult,theappropriateinvestigationsleadtothepromptdiagnosisofanadrenalade noma inthepatient, which as treatedon time, thussaving thepatient'slife.

CASESTUDY

A 52-years old patient from Bangladesh was presented to the hospital. About a year ago, he hadbeendiagnosedwithhypertensionandstartedanoralantihypertensiveregimenofAmlodipine/Telmisartan at a dose of 10 mg/80 mg. Now, a year later, he was still experiencinguncontrolledbloodpressure.Itremainedonthehighersidedespitetakingregularantihypertensives,buttherewerenoothercommonalarmingfactors,suchasheadache,vomiting,or blurring of vision. The patient's lab workup revealed that he was suffering from primaryhyperaldosteronism.Whenhewasreferredtothehospitalhehadhighaldosteronelevelswithlowreninlevels,alongwithpersistentlyelevatedbloodpressurelevels.Therefore,forfurtherevaluationandtoreachaproperdiagnosis,thepatientwassenttogetanMRIofhisadrenalgland,bothwith and without contrast.

Investigations

Pic 1. Thefollowing investigationsandlab work-upswere ordered:



ECG

Event	Result	Ref. Range	Status
Cortisol AM	380 nmol/L	(171 - 536)	
TV Catechol Fract	2.180 L		
Ur Dopamine	* 405 nmol/L		
Ur Epinephrine	<10 nmol/L		
Ur Norepineph	84 nmol/L		
U24 Dopamine	* 883 nmol/24 hrs	(- <=3240)	
U24 Epinephrine	* <22 nmol/24 hrs	(- <=150)	
U24 Norepineph	* 183 nmol/24 hrs	(- <=570)	
TV Metanephrines	2.180 L		
Ur Metanephrine	* 138 nmol/L		
U24 Metanephrine	301 nmol/24 hrs	(- <=2000)	
Surgical pathology Final Report	* 02-SP-21-0010441		
Sodium Lvl	* 139.0 mmol/L	(135.0 - 145.0)	
Potassium Lvl	* 5.2 mmol/L	(3.6 - 5.1)	
Chloride Lvl	* 106.0 mmol/L	(98.0 - 107.0)	
CO2	* 24.7 mmol/L	(22.0 - 29.0)	

Table 1Laboratory Results

Event	Result	Ref. Range	Status
Aldost Standing	* 320.00 ng/L	(50.50 - 310.50)	
Renin Act (std)	* 2.55 ng/L	(4.00 - 37.52)	
Aldosterone/Renin Ratio (Standing)	* 125.49		
ARR (standing) Pathologist comment	ARR (standing) Pathologist comment		
Aldost Supine	* 308.50 ng/L	(28.80 - 158.60)	
Renin Act (sup)	* 2.80 ng/L	(4.00 - 23.70)	
Aldosterone/Renin Ratio (Supine)	* 110.18		
ARR (supine) Pathologist comment	ARR (supine) Pathologist comment		
Potassium Lvl	* 3.2 mmol/L	(3.6 - 5.1)	

Table 2Laboratory Results

Figure 1. TheseMRIsofthe patient wereobtained:

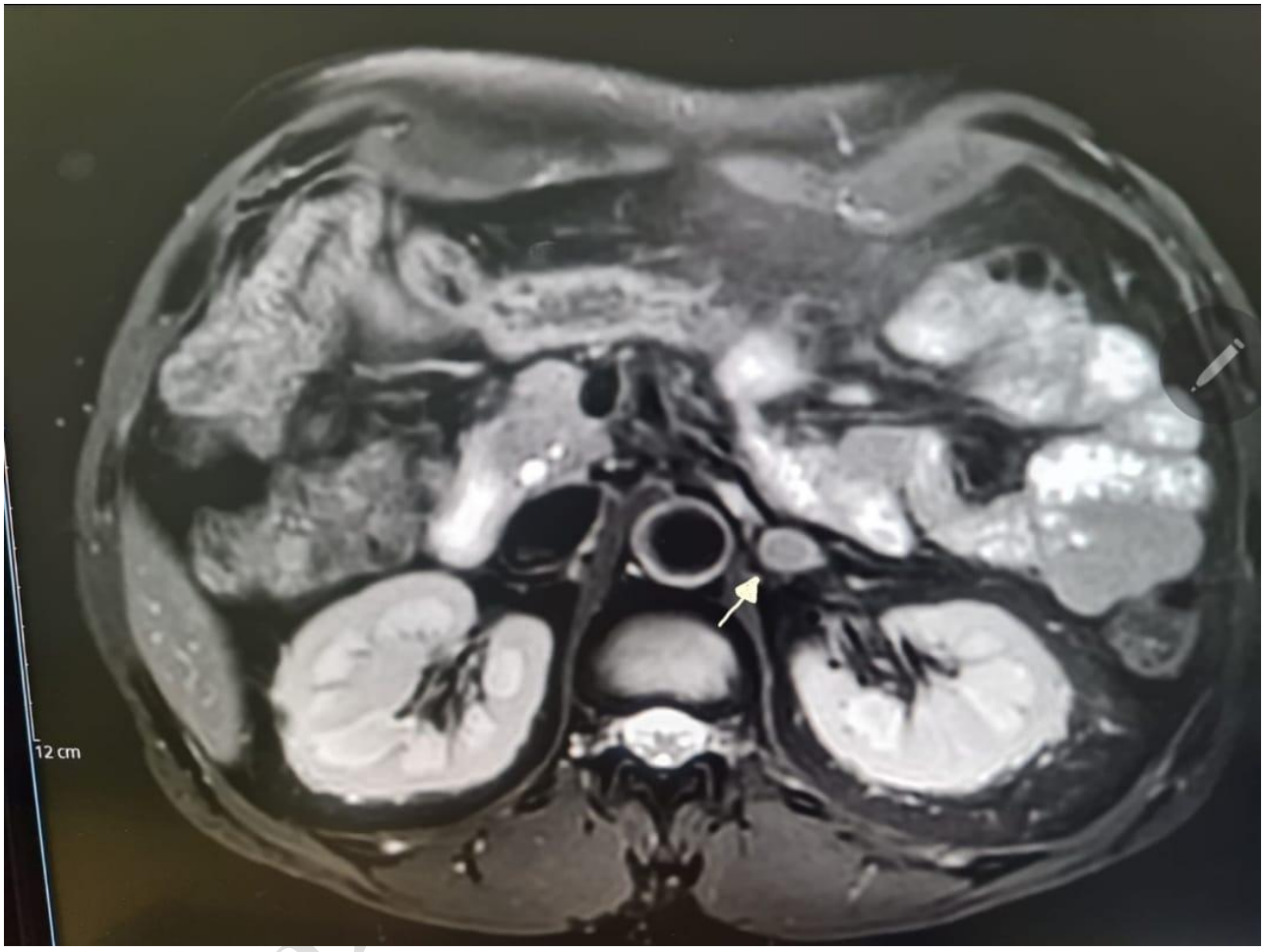
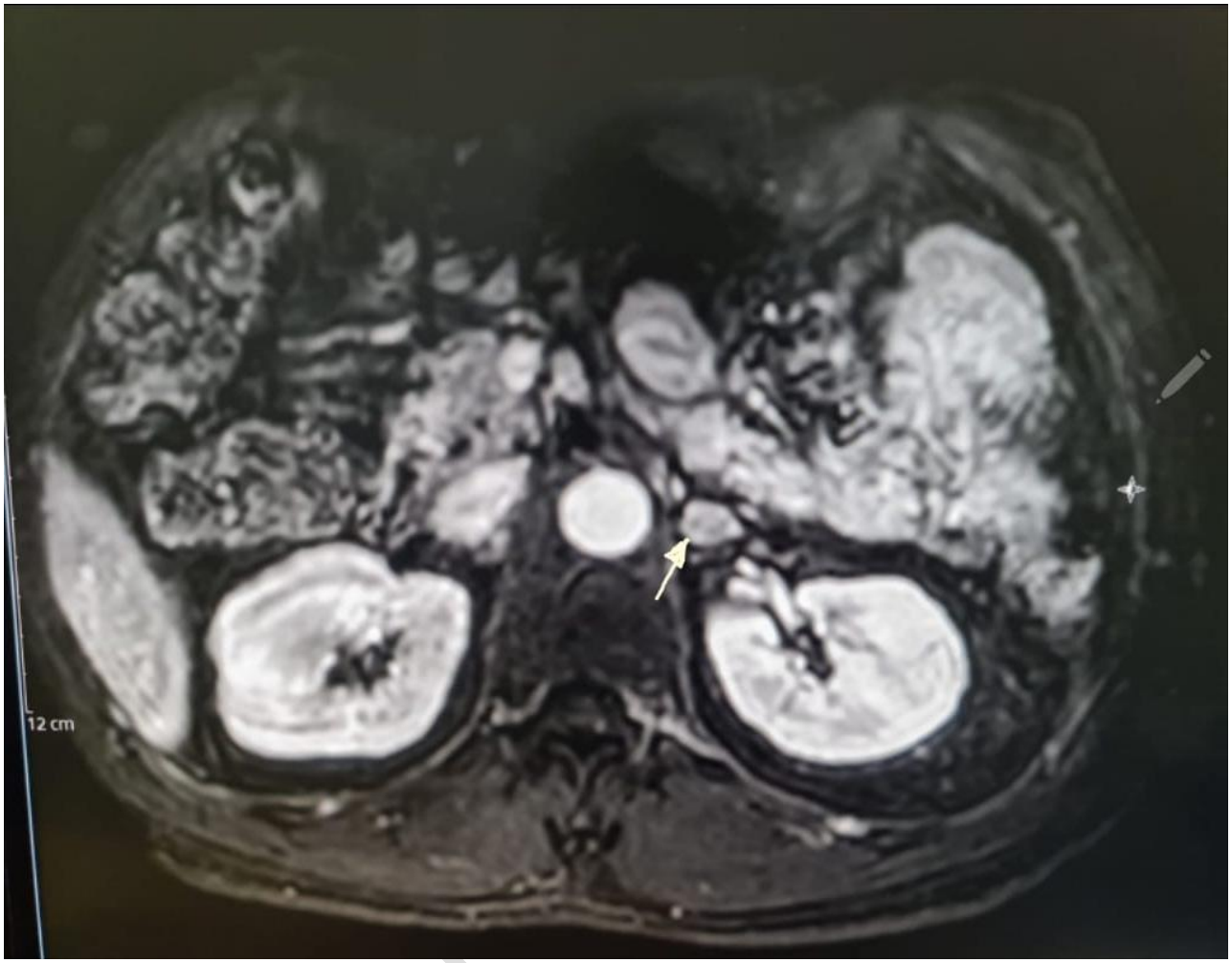


Figure 2 MRI scan image



Findings

Accordingto theabove MRI scans,the patient wasfound tobe harboringanapproximately 14 x 10.4 x 10.8 mm fairly-defined, oblong-shaped focal lesion, along the maximum TS, AP, and CCdimensions.This lesion was implicating the inferior portion of the left adrenal gland laterallimb, and exhibiting low to intermediate signal intensity on all provided sequences with signaldropout on out of the phase sequence. Moreover, minimal peripheral contrast enhancement wasnotedinthepost-contrast administration images.

DiagnosisandManagement

Afewweekslater, thepatientcameback forhis MRIreports.An expertreviewrevealed thathewas harboring a left adrenal adenoma, consistent with the findings of the MRI where a focal,oblonglesion was noticed.

Sensing the seriousness of the situation, the patient was immediately sent to the surgery clinic forfurther evaluation and assessment. Here, the patient was given a 24-hour metanephrine test,which wasnegative.

Within the same week, the patient's tests and reports were repeatedly reviewed, and he wasbookedfor a laparoscopic adrenalectomythe following week.

Following the laparoscopic adrenalectomy, the patient was kept under observation. Soon afterthe surgery, the patient was seen to have high blood pressure and low potassium levels, whichraisedconcerns foran ensuingpost-surgery complication.

Patient's blood Pressure Summary and Comparison before and after Surgery

BP Reading Before Surgery			**BP Reading After Recovery**		
178 mmHg	188 mmHg 187 mmHg	190 mmHg 188 mmHg	138 mm Hg 87 mm Hg	119 mm Hg 77 mm Hg	126 mm Hg 83 mm Hg

Asummaryof thepatient'spostoperative daysisgivenbelow:

Day1 Post Op:

- Keptunderobservationas perprotocol.

Day2 Post Op:

Thepatientwas startedona medicine regime consisting of:

- Spironolactone(50 mg,BID)
- Valsartan(160 mg)
- Amlodipine(10 mg)

Thepatient’spotassiumlevelswereseentoimprovefrom 3mmol/lit to3.3mmol/lit.

DischargeSummary:

On the 4th day post op, the patient was discharged in a stable state. Four days after discharge, thepatient was called in again for a follow-up appointment. He was examined and observed to havestable and controlled blood pressure. Since the blood pressure was within limits (not higher than180/110mmHg), it wasdecidedthathisspironolactone and valsartan couldbe stopped.

On this day, the patient's potassium levels were also seen to be within the normal range. Fromthisday onwards,the patientwas advised totakeonlytheAmlodipine(10mg) oncedaily.

Amonthafterthisfollow-upappointment,allantihypertensivemedicinesthatthepatienthadbeen takingwere stopped.

BiopsyResults

Narratedbelow arethe biopsyresultfindings:

Table 3biopsy result findings

Specimensource:leftadrenalglandwithtumor.
The specimen was received in formalin labeled with the patient's name and medical recordnumber.It consists of a single fibro fatty piece of tissue, measuring 7.5 x 5 x 3.0 cm includingthe adrenal gland.The specimen weighs 30.2 grams in total. The nodular fragment is attached tothe rest of adrenal loosely, but can be easily separated from the tissue, measuring 1cm inmaximum diameter and weighing 0.7 grams.The adrenal gland is partly cystic, measuring 5.5x2 x1cm.
Pathologyresult:
Adrenalgland tumor,resection: ● Featuresconsistent withadrenal corticaladenoma. ● Nonecrosis or atypia isseen. ● Aldosteronesecretingadenoma.

DISCUSSION

Adrenal adenomas are benign lesions that occur within the substance of the adrenalglands.These adenomas can either be functioning or non-functioning, depending on if they release anyhormonal secretions. However, the majority of clinically diagnosed adrenal adenomas are foundto be clinically silent. These adenomas might otherwise be over-secreting any hormone that theyused to produce normally. In the context of the case presented here, the patient was sufferingfrom an evident case of persistently elevated blood pressure levels. Now, primary aldosteronismis seen to be one of the leading causes of secondary hypertension in patients.[4] This patient wasnotsuspectedtosufferfromprimaryhypertensionbecausehehadalreadybeendiagnosedwithita yearearlierand hadbeenstarted onanoral antihypertensiveregimen,whichdid not helphimat all. This failure was a clear indication that hypertension was occurring due to some otherreason.

Oncea patienthas beendocumentedtobe sufferingfrom primaryaldosteronism, thenext stepisto obtain the patient's imaging studies. Imaging is important as it helps in diagnosing if thepatienthas any tumor orto prepare him for his subsequentsurgery.[5]

Coming back to the point, silent adrenal tumors are usually not problematic and are diagnosed asincidental findings. However, aldosterone-secreting tumors can arise in the form of symptomatictumors that present as nothing but uncontrolled hypertension with seemingly no probable cause.However, uncontrolled blood pressure caused by this does not go down even when the patient istakingmedication forit.[6]

Oncethepatienthasbeenconfirmedasacaseofunilateralprimaryaldosteronism,alaparoscopicadrenal ectomyisnowrecommended. Thechoice ofalaparoscopic approachover a

traditional, open surgery is to avoid cardiovascular, renal, and other complications, to promotethe control of the secretion of aldosterone and other hormones, and to reduce total recovery timepost-surgery so that the patient can simultaneously be monitored and observed for any oncomingcomplications. [7][8]

Once the laparoscopy was done, the patient was seen to have a stabilized condition, and therewasno further risk of any hypertension orother complicationpresent.

CONCLUSION

Secondaryhypertensionwas seenasa rarecauseof primaryaldosteronism untilrecently.Now,the clinical diagnosis of uncontrolled hypertension is increasing yearly. When diagnostic testsreveal the adrenal glands are responsible, there is an immediate need to find the case of themyriad symptomsinthe patient.

Thanks to the popular and advanced treatment therapy known as laparoscopy, adrenal tumors arenoweasily resected,andthe patientcan return totheir normal condition as earlyas possible. Laparoscopy reduces the post-surgery downtime and helps to keep the patient's condition incheckaftersurgery, which is equally important.

Consent Disclaimer:

As per international standard or university standard, patient's consent has been collected and preserved by the authors.

REFERENCES

1. Megha R, Wehrle CJ, Kashyap S, et al. *Anatomy, Abdomen and Pelvis, Adrenal Glands(Suprarenal Glands)* [Updated 2021 Feb 10]. In: StatPearls [Internet]. Treasure Island(FL): StatPearls Publishing; 2021 Jan-. Available from:https://www.ncbi.nlm.nih.gov/books/NBK482264/

2. Dutt M, Wehrle CJ, Jialal I. *Physiology, Adrenal Gland*. [Updated 2021 May 9]. In:StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Availablefrom:https://www.ncbi.nlm.nih.gov/books/NBK537260/

3. Byrd,J.B., Turcu,A. F.,&Auchus,R.J. (2018).Primary Aldosteronism:PracticalApproach to Diagnosis and Management. *Circulation*, 138(8): 823–835.https://doi.org/10.1161/CIRCULATIONAHA.118.033597

4. Morimoto,R., Omata,K., Ito,S., &Satoh, F.(2018). Progress intheManagementofPrimary Aldosteronism. *American Journal of Hypertension*, 31(5): 522–531.https://doi.org/10.1093/ajh/hpy018

5. WeissLM.Comparativehistologicstudy of43metastasizingandnonmetastasizingadrenocorticaltumors.*Am J Surg Pathol*1984; 8:163–169.

6. PaschouSA,Vryonidou A,Goulis DG.Adrenalincidentalomas: Aguidetoassessment,treatmentand follow-up.*Maturitas*,92. Oct 2016: 79-85.

7. Rossi GP, Cesari M, Cuspidi C, Maiolino G, Cicala MV, Bisogni V, Mantero F, PessinaAC. Long-term control of arterial hypertension and regression of left ventricularhypertrophywithtreatmentof primaryaldosteronism.*Hypertension* 2013;62:62–69.

8. Indra T, Holaj R, Štrauch B, Rosa J, Petrák O, Šomlóová Z, Widimský J Jr. Long-termeffects of adrenalectomy or spironolactone on blood pressure control and regression ofleft ventricle hypertrophy in patients with primary aldosteronism. *J Renin AngiotensinAldosteroneSyst*2015; 16:1109–1117.

9. Jones, J., Niknejad, M. Adrenal adenoma. Reference article, Radiopaedia.org. (02 Nov 2021) https://doi.org/10.53347/rID-862

10. Update on CT and MRI of Adrenal Nodules by Schieda N, Siegelman ES.AJR Am J Roentgenol. 2017 Jun;208(6):1206-1217.