CALCUTTA ACADEMY OF RADIOLOGY

INSIDE THIS ISSUE:

Calcutta Academy Of Radiology

VOLUME I ISSUSE III AUGUST, 2020

Pandemic, Healthcare and Webinars.

Hi! Namaste,

This is Dr. Viral Parekh from Kolkata, India. It is a peasant experience to bring out this third newsletter of Calcutta Academy Of Radiology.

As the pandemic is wreaking havoc on the health of every person of the world, there is constant fear amongst everyone that they are sooner or later going to be infected with the coronavirus. As the world is living under constant fear, there is another problem facing the world is that of mental health. People are losing jobs, and those who have not lost their jobs are facing drastic reduction in their income. During such a difficult time, one community which is fighting valiantly in the forefront is the medical fraternity. The doctors, the nurses and paramedical staff are hailed as Corona Warriors. That is quite frustrating because these Warriors are fighting without much ammunition.

Most of the hospitals are not well equipped to face the pandemic of such a mammoth scale.

The governments of all hues and colours to hide their own drawbacks is passing on the entire responsibility to the medical fraternity. Many of this fraternity are getting infected with the coronavirus and many of them have sacrificed their lives to protect and to heal the society. This is utterly disgusting not only on the part of government but also society.

We never thought it prudent to invest in health care and to establish an ever-ready hospitals and medical centres to take on any eventuality. Consequently, we are facing a large-scale calamity and has left the medical community in lurch to fight the pandemic almost single-handedly. I hope, the government and the society will learn from this pandemic and we will have a much better health care system for the coming generation.

★

Lockdown started in India in last week of March, 2020 and in next few days, we had slew of Radiology webinars, announced by Radiology equipment manufacturing companies as well as multiple small to large Radiology organizations. Initially, it seemed that it is a good learning from home. But, then it has crossed all limits and at a time there are 5-6 webinars per day.

Is there a method behind this madness? Why this overkill? It is for everyone to ponder upon.

We are grateful to Dr. Bhavin Jankharia, Dr. Sukalyan Purkayastha, Dr. Mayukh Bhattacharya, Dr. Hirak Ray Choudhury, Dr. Amar Udare, and Dr. Ankur Shah for contributing to this newsletter and in the process making it rich in its scientific content.

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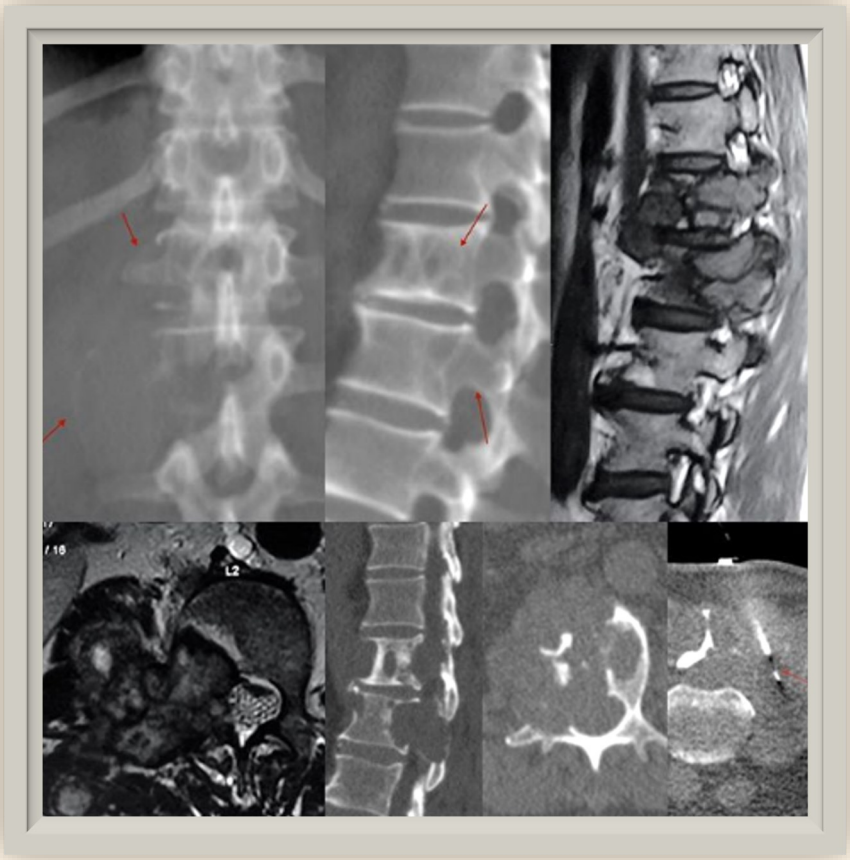
Dr. Bhavin Jankharia needs no introduction to the Radiology fraternity. As you all know he is a renowned Radiologist and academician and has contributed immensely in propagating Radiology education. Presently, he is a Consultant Radiologist at Picture This by Jankharia. He is also a Trustee of Radiology Education Foundation. He has consented to share some of his work with us, which will help all the Residents as well as practicing Radiologists. Here is some information about him in brief.

- He has written 5 books, 35 chapters, 57 articles (PubMed listed)
- Presented 32 posters
- More than 1500 invited lectures over 27 years
- Editor-in-Chief, Indian Journal of Radiology & Imaging (2007-2012)
- Latest Book (2019): Computed Tomography of Interstitial Lung Diseases
- Hon. Visiting Consultant – Radiology – Tata Medical Centre, Kolkata
- Past President – Indian Radiology & Imaging Association – 2014

Case I



This 54 years old man with backache and radiculopathy came for an MRI - his x-rays were reported normal, but as you can see on the simulated X-rays from the CT scan data (using the Mean function), there is an expansile lesion involving L1 and L2. The MRI showed a T2 dark lesion and our first diagnosis was a giant cell tumour, though the lesion did involve two contiguous vertebrae and had an unusual scalloped appearance. A vascular tumour may present in this manner, but that's a difficult diagnosis to make. Given the age (above 45 years), metastatic disease was also a differential.

The biopsy was simple and straightforward with an 18G coaxial biopsy gun.

The final diagnosis was hemangioendothelioma. I don't think a pre-biopsy diagnosis of this tumor can be made.

Case II

Why Every Infectious Spondylitis Needs a Biopsy Even in India.

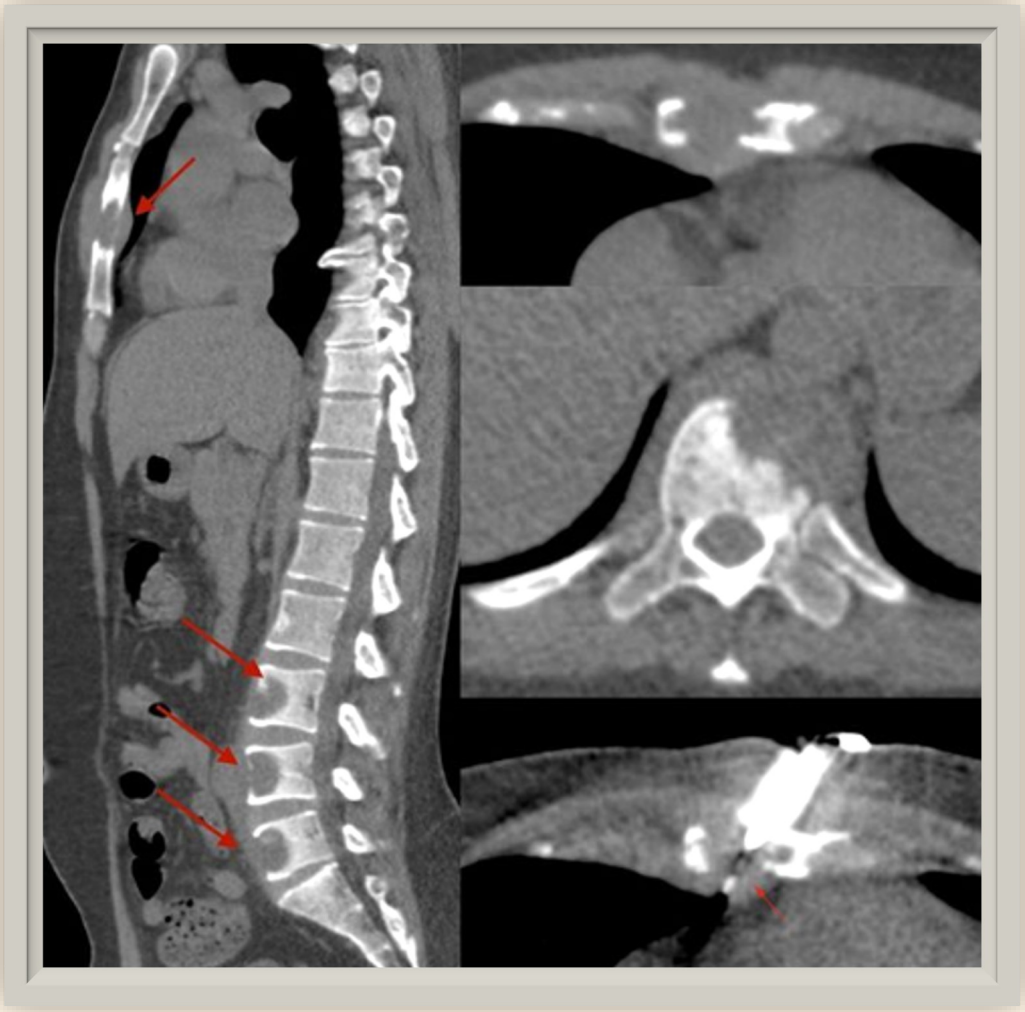
This 76-years old man presented with backache and fever. MRI (T1W sag and T1W post-contrast axial) showed a classic infectious spondylitis. The working diagnosis was tuberculosis, but at this age, in this region, without an obvious abscess, a bacterial cause should be considered. The CT scan at the time of the biopsy showed typical findings with sclerosis.

I did a biopsy with an 18G coaxial biopsy gun and it showed Enterococcus fecalis. He was put on appropriate treatment and 3 months later, the follow-up MRI (T1W sag and T2W axial) showed improvement.

Basic Rules: Every infectious spondylitis in India is not tuberculosis and every infectious spondylitis must be biopsied.

Dr. Bhavin Jankharia, MD

Case III



Choosing the Right Site To Biopsy - Sternum Vs Spine .

This 34 years old had backache. An MRI (images not available) showed spine and sternal lesions. The CT scan showed the eccentric vertebral lesions that are easy to biopsy, but the sternal lesion is easier and allows even more tissue to be obtained. Also while the spine lesions seem to be due to an infection like tuberculosis, the sternal lesion is unusual and may be the better lesion to biopsy from that perspective as well.

Using an 18G coaxial biopsy gun, I biopsied the sternal lesion using an oblique approach.

The diagnosis was tuberculosis.

Dr. Sukalyan Purakayastha, MD, DM
Consultant Neuroradiologist,
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SPONTANEOUS THROMBOSIS OF VEIN OF GALEN MALFORMATIONS

Abstract:

Vein of Galen malformations are rare malformations of the intracranial circulation that usually manifest due to the high flow arteriovenous shunt that is present across the lesion. Less than 30 cases of spontaneous thrombosis of vein of Galen malformations have been reported in literature. Identification of complete thrombosis radically alters the management of these lesions. We report clinical and imaging findings in two patients with thrombosed vein of Galen malformations and discuss the pathophysiological principles of management in such lesions.

Key Words:

Vein of Galen malformation, spontaneous thrombosis

Introduction:

Vein of Galen malformations (VOGMs) are extremely uncommon anomalies of the intracranial circulation. The clinical manifestations of these lesions are variable and can range from refractory congestive heart failure in the early neonatal period to a relatively benign neurological presentation with headache, seizures or delayed milestones. Though spontaneous thrombosis in these lesions is a rare occurrence, it has profound implications on the management and prognosis.

Case Reports:

This 11-month-old female child born at term to non-consanguineous parents had presented with history of progressive enlargement of the head since seven months of age and inability to attain expected milestones. There was no history of vomiting, loss of consciousness or weakness of limbs. Physical examination revealed a child with a large head and bulging anterior fontanel. Head circumference was 51cm. Detailed neurological and cardiovascular examination did not reveal any other neurological deficits. CT scan of the brain revealed a large hyperdense mass lesion in the posterior third ventricular region, causing obstructive hydrocephalus. Magnetic Resonance Imaging (MRI) of the brain (Figure 1) revealed a rounded space-occupying lesion measuring 45mm in diameter, located in the quadrigeminal cistern causing compression of the third ventricle and upper brainstem, with resultant obstructive hydrocephalus. There was inferior displacement of the tentorium and vermis of the cerebellum. There were no signal voids within the lesion indicating the absence of flow within it (Figure 2a). Time of flight and phase contrast MR angiography (Figure 2b) confirmed the absence of flow within the lesion.

Considering the benign nature of the anomaly, angiographic evaluation was not performed. After considering all modalities of therapy, the child was subjected to placement of a medium pressure ventriculo-peritoneal shunt. The surgery and post-operative hospital stay were unremarkable. One month later, the child was readmitted with shunt malfunction and revision with a low-pressure shunt was performed. CT scan of the brain performed 9 months after placement of the ventriculo-peritoneal shunt

(Figure 3) revealed reduction in the size of the lesion to a diameter of 30mm. The ventricles were non-dilated and there were bilateral thin subdural fluid collections. The child is on follow up for over 28 months following the ventriculo-peritoneal shunt and does not show any neurological symptoms at present.

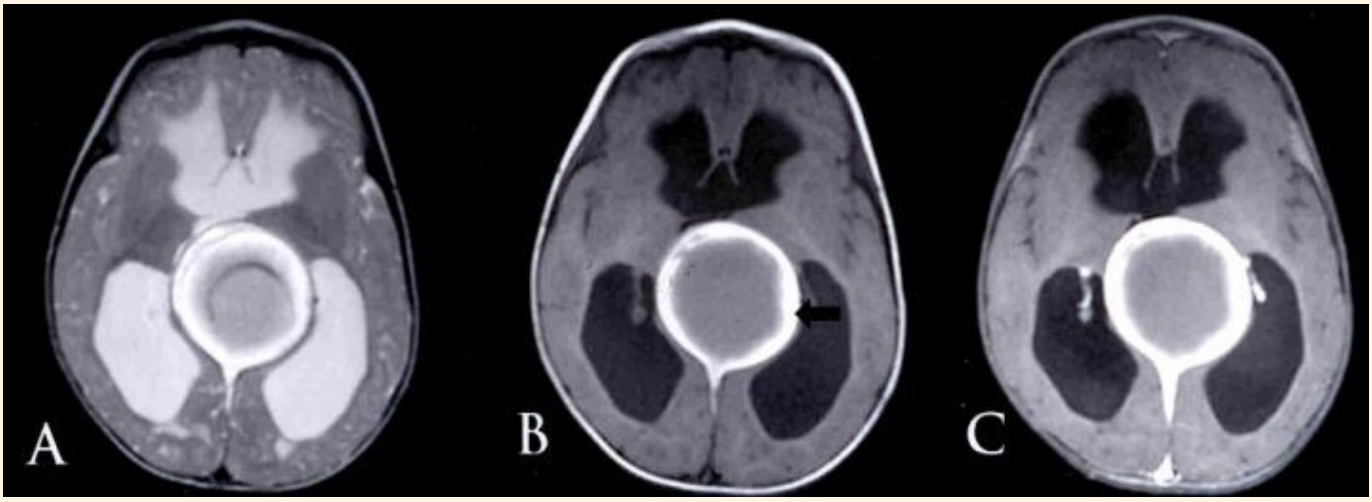

Figure 1:
T2-Weighted (a), T1-Weighted (b) and post contrast T1-Weighted (c) MR images of the brain in the axial plane reveal aneurysmal dilation of vein of Galen.

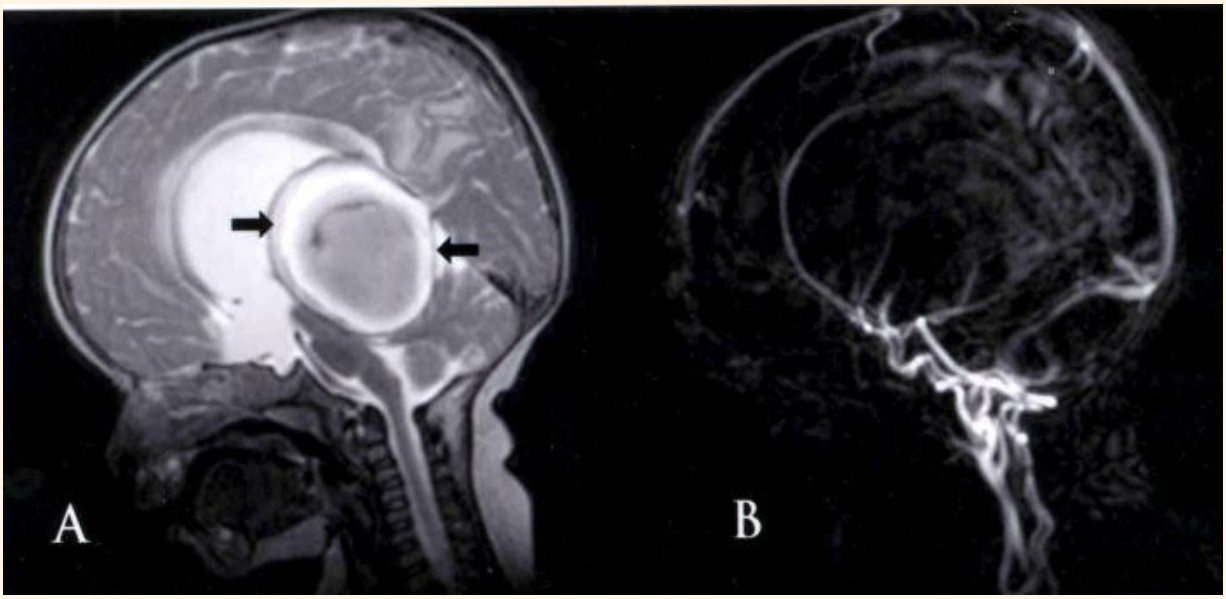

Figure 2:
T2-Weighted sagittal MR image of the brain (a) demonstrates the mass effect caused by the thrombosed malformation. Phase contrast MR angiogram (b) confirms the absence of flow within the lesion.

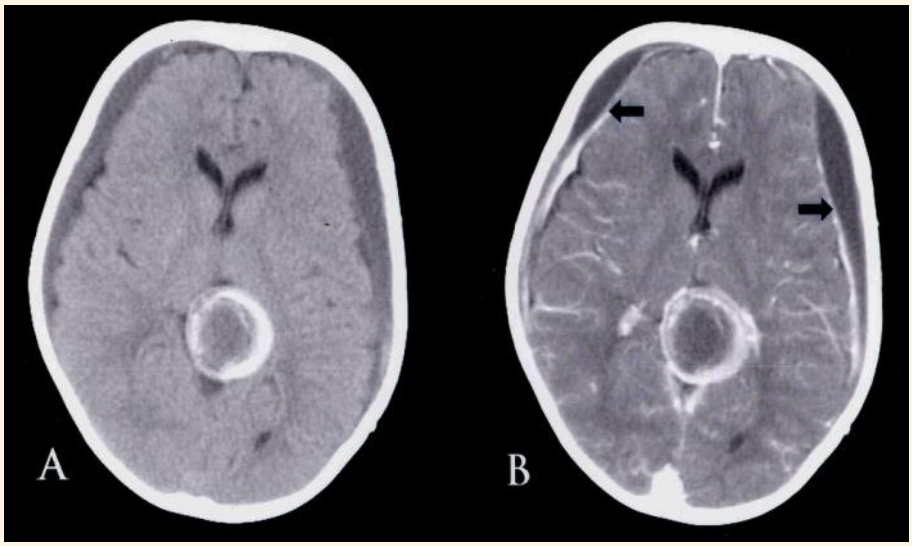

Figure 3:
Plain (a) and post contrast (b) CT scans reveals thrombosed venous sac with wall calcification and absence of enhancement within the lesion.

Discussion:

VOGMs are thought to arise during 6-11 weeks of fetal development, as a result of abnormal arteriovenous communications between the arteries that normally supply the telachoroidea and the quadrigeminal plate, and a primitive vein – the median prosencephalic vein (of Markowski). The consequent persistence and enlargement of this primitive vein results in the formation of an aneurysmally dilated structure that is characteristic of these lesions.

Descriptions of spontaneous thrombosis of VOGMs have been limited to isolated case reports. Hurst etal. (1992) reviewed the clinical and angiographic findings in 22 such cases reported in literature till 1992. Since then, another 7 cases have been reported (Kuroki et al.1995; Nikas et al. 1999; Konus et al. 2000; Konovalov et al. 2002,Tawk et al. 2002). Stagnant flow due to restriction of venous outflow (Hurst etal, 1992) or of feeding arteries (Kuroki et al.1995), compression by hematoma, vascular spasm, regressive changes in vessel walls (Nikas et al.1999), and effect of contrast media (Konus et al. 2000) have been suggested as possible explanations for spontaneous thrombosis.

The true incidence of spontaneous thrombosis is not known. However, identification of this phenomenon is of tremendous importance, as complete thrombosis significantly alters the intracranial hemodynamic mechanisms, and thereby significantly changes the line of management in these patients. Most patients with patent VOGMs present in infancy with features of cardiac failure or during childhood with predominant neurological symptoms. The high flow across the intracranial shunt necessitates a compensatory increase in the cardiac output and blood volume to maintain perfusion of systemic vasculature. This may result in a spectrum of cardiac manifestations, which can range from asymptomatic cardiomegaly to severe congestive heart failure that is resistant to medical management. In infants with refractory congestive heart failure, emergency embolization of the lesion may be required to ensure survival.

Cerebral venous hypertension is the etiopathogenetic factor that is responsible for most neurological manifestations of patent VOGMs. The high flow across the fistula causes venous congestion that is responsible for the hydrocephalus as well as the ischemic damage to the cerebral parenchyma. MRI in these patients frequently reveals patency of the aqueduct of Sylvius and absence of transependymal seepage of cerebrospinal fluid. Thus, the ventriculomegaly associated with VOGMs is likely to result from cerebral hemodynamic abnormalities, rather than due to mass effect on the ventricular system. Shunting procedures for ventriculomegaly in these patients are thus, poorly tolerated (Schneider et al. 1992) and must be preceded by elimination or reduction of the arteriovenous shunt by endovascular therapy.

Thus, the primary management in children with patent VOGMs with either cardiac or neurological symptoms involves reduction of flow across the arteriovenous shunt. In contrast, after complete thrombosis, VOGMs behave like space occupying lesions and present purely due to mass effect on the surrounding structures. As seen in the infant described in this report, patients who have spontaneous thrombosis of VOGMs usually present with hydrocephalus secondary to aqueductal compression. Presentation with venous sinus thrombosis, subarachnoid hemorrhage, seizures, hemiparesis and cerebellar signs has also been described (Hurst etal. 1992). None of the children reported in literature had heart failure at time of presentation (Nikas et al. 1999).

About two thirds of patients reported in literature required ventricular shunting, while a quarter needed surgical removal of the offending lesion. In contrast to the poor outcome of children with patent VOGMs that are left untreated, most authors have reported a good clinical outcome in cases of thrombosed VOGMs, with moderate to severe neurological deficits occurring in only 10-15% (Nikas et al. 1999). Follow up imaging studies have revealed regression in size of the malformation in several reports [Hurst etal. 1992; Nikas et al. 1999]. The second infant described in this report is on regular follow up and has shown nearly 70% reduction in the volume of the thrombosed venous sac on follow up CT scan performed 9 months after the placement of ventriculo-peritoneal shunt. Use of Color Doppler ultrasound, MRI and MR angiography may permit follow up imaging of these children without the use of invasive techniques or ionizing radiation.

Identification of complete thrombosis in vein of Galen malformations permits institution of conservative management in these patients. Shunting of the hydrocephalus may be required to manage the acute neurological syndrome. Clinical follow up may reveal spontaneous regression in the size of lesion. Surgical excision of the lesion may be restricted to children who continue to be symptomatic due to mass effect on the surrounding structures.

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APPLE CORE LESION

- Radiological manifestation of a focal stricture of bowel in Barium Enema examination. The stricture shows shouldered margins and resembles core of an apple that has been partially eaten.
- Seen in annular carcinoma of colon.

APPLE CORE LESION

Dr. Viral Parekh, DMRD, DNB.

We are thankful to all the contributors for sharing their experiences and literature with us and in the process helping the Radiological fraternity.

We are on YouTube and Facebook

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Musculoskeletal MRI.

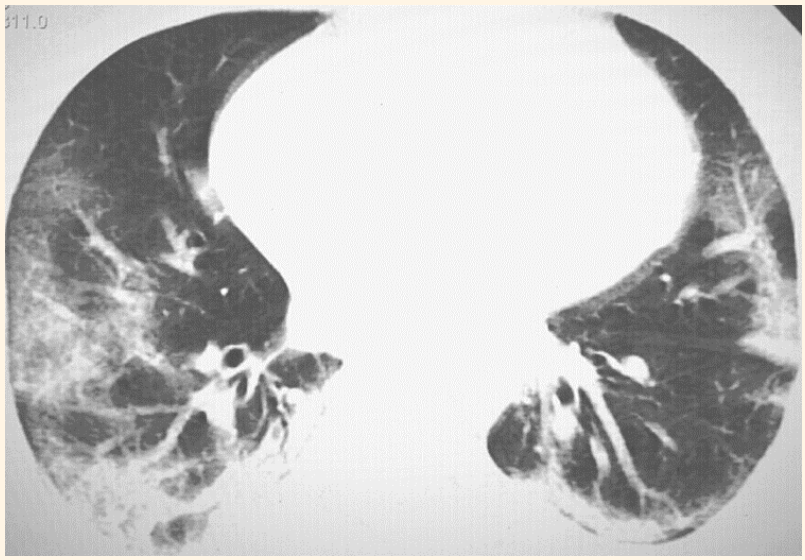
PITFALLS IN HRCT THORAX REPORTING OF COVID-19 PATIENTS: EXPERIENCE IN A SUBURBAN HOSPITAL

In the past few months we all have been experiencing a remarkable spurt in novel coronavirus infection (COVID-19) cases. Subsequently, there has been a rise in number of requisitions for HRCT of patients admitted with symptomatology related to COVID and with contact or recent travel history. Although many radiology associations worldwide including ACR and Fleischner Society have not recommended CT scan for routine screening of suspected cases, in our Hospital, the clinicians have routinely used HRCT as a primary tool to segregate patients who would need isolation from those who were admitted to general ward on the basis of positive findings on CT. This approach had become more justifiable in light of delay in availability of RT-PCR reports of nasopharyngeal swab samples as well as documented false negative virology reports. A CT with typical findings of COVID infection proved invaluable in patient triaging and reducing chances of transmission of infection to health workers as well as non-COVID cases.

However, in our experience while reporting HRCT of suspected viral pneumonia cases, there were few pitfalls in imaging which I would like to share. The final diagnosis of patient was quite different from what the CT scan assumed to be.

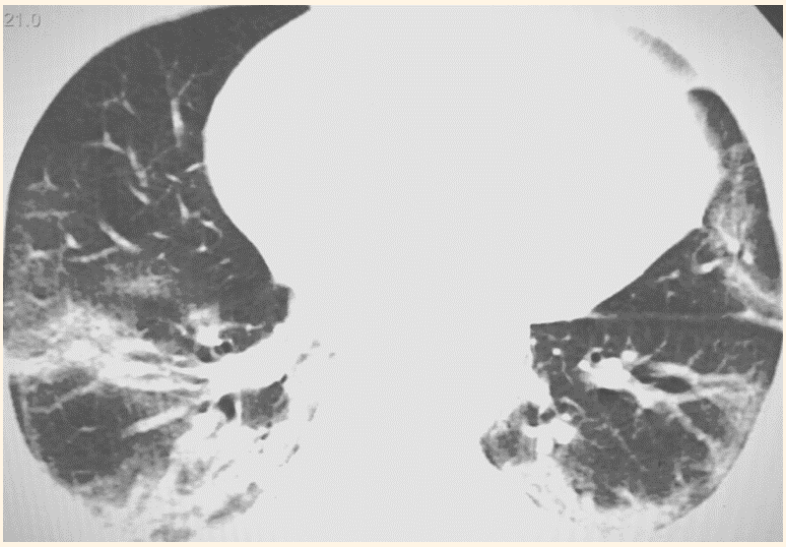
CASE 1

A 75-year-old male presented with fever and dyspnea. His blood reports were unremarkable with normal leukocyte count and CRP. HRCT showed multiple ground glass opacities as well as few subsegmental peripheral patches of consolidation in both lungs raising strong suspicion of novel Coronavirus infection. Few small subpleural nodules were also identified. Patient was shifted to isolation ward and swab samples were sent for RT-PCR. In the meantime, patient complained of backache and was sent for an MRI of dorsal spine which showed multiple lytic lesions in dorsolumbar vertebral bodies. A subsequent USG showed infiltrative SOL in liver. PET-CT was done which corroborated USG and MRI findings with metastatic disease in lungs and spine and likely primary in liver. Patient tested negative for COVID.



Case1 fig (i)

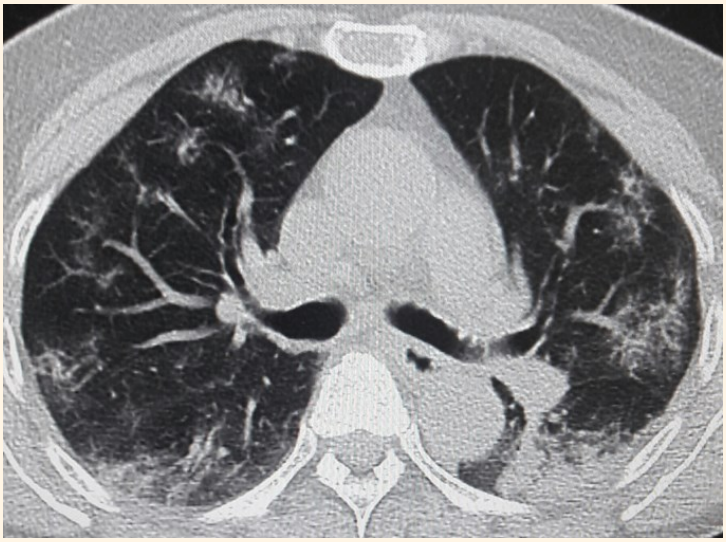
Case I Figure 2



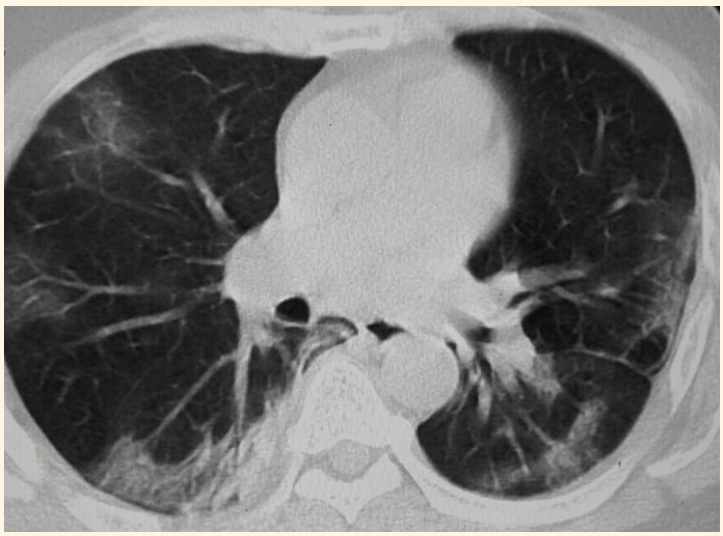
Case 2

A 65-year lady presented with mild shortness of breath of short duration, lassitude but no fever. Her blood counts were unremarkable. Blood sugar was elevated. HRCT thorax showed bilateral peripheral patches of ground glass densities. Patchy subsegmental consolidation was detected in left lung base. As findings were strongly favouring viral pneumonia, patient was isolated and swab samples sent for urgent RT-PCR. Surprisingly, the results came negative. The patient responded to broad spectrum antibiotics and was discharged after a fortnight having been retested for COVID-19 and again found not to be carrying the viral infection. The discharge summary stamped the case as bronchopneumonia with type 2 DM.

Case II figure 1

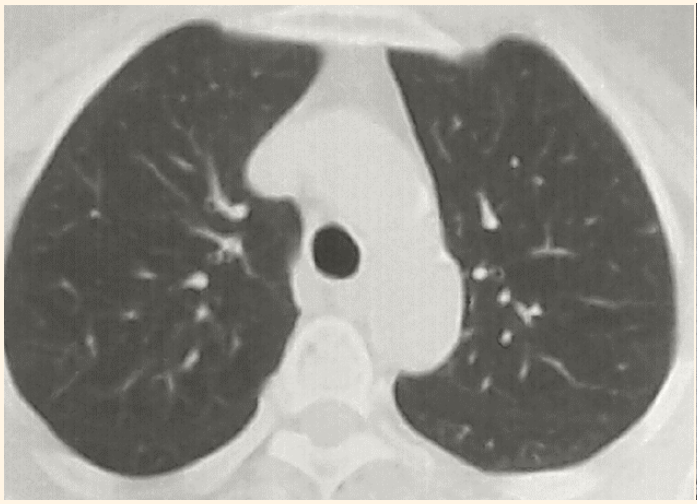


Case II figure 2

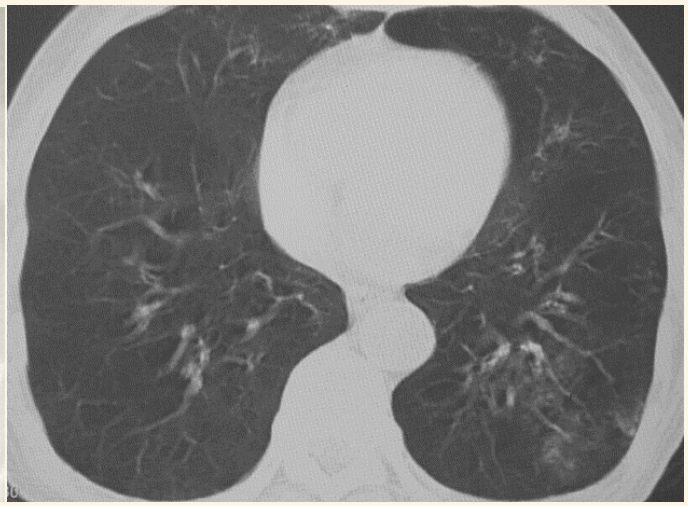


Case 3

A 46-year-old male patient was admitted with history of assault and blunt trauma to chest. Chest x-ray was done which was normal. As pain didn't subside, patient underwent a CT to rule out rib or any other skeletal injury. The HRCT was also reported to be unremarkable apart from non-specific ill-defined altered attenuation focus in left lower zone. The next day itself, he developed low grade fever and the clinician sent his nasopharyngeal swab for COVID infection testing. Remarkably, the result came out to be positive and patient was treated accordingly. We retrospectively looked at the CT images in greater detail. Finally, it was agreed upon that the patient had subtle and small non-rounded GGO in left lower lung documented as indeterminate CT finding related to nCoV infection.



Case 3 Figure 1



Case 3 Figure 2

The lessons we learnt from reporting a considerable number of HRCTs of patients sent to us for COVID screening are the following:

1. The typical findings very strongly favouring diagnosis of COVID may not necessarily be due to the viral infection in absence of relevant signs and symptoms of the disease.

2. Many lung diseases may mimic appearance of COVID infection including tuberculosis, pyogenic infections, septic emboli and even malignancies.

3. In present day context, each and every CT thorax should be carefully scrutinized so as to not miss any subtle finding of viral pneumonia.

4. Negative CT chest never rules out COVID infection due to obvious reasons as early infection cases often do not show any changes in lungs. With increasing disease severity, CT scan findings corroborate positive RT-PCR report.

5. We must not forget to rule out any co-existent lung pathology in CT scans of nCOVID patients.

6. In spite of the pitfalls, HRCT thorax is an important adjunct to RT-PCR in diagnosing COVID. It is invaluable in patient triaging when prompt microbiological testing facilities for viral disease are not available and in case of resource constrained medical infrastructure where there is significant time lag between sample collection and RT-PCR report availability.

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Dr. Amar Udare

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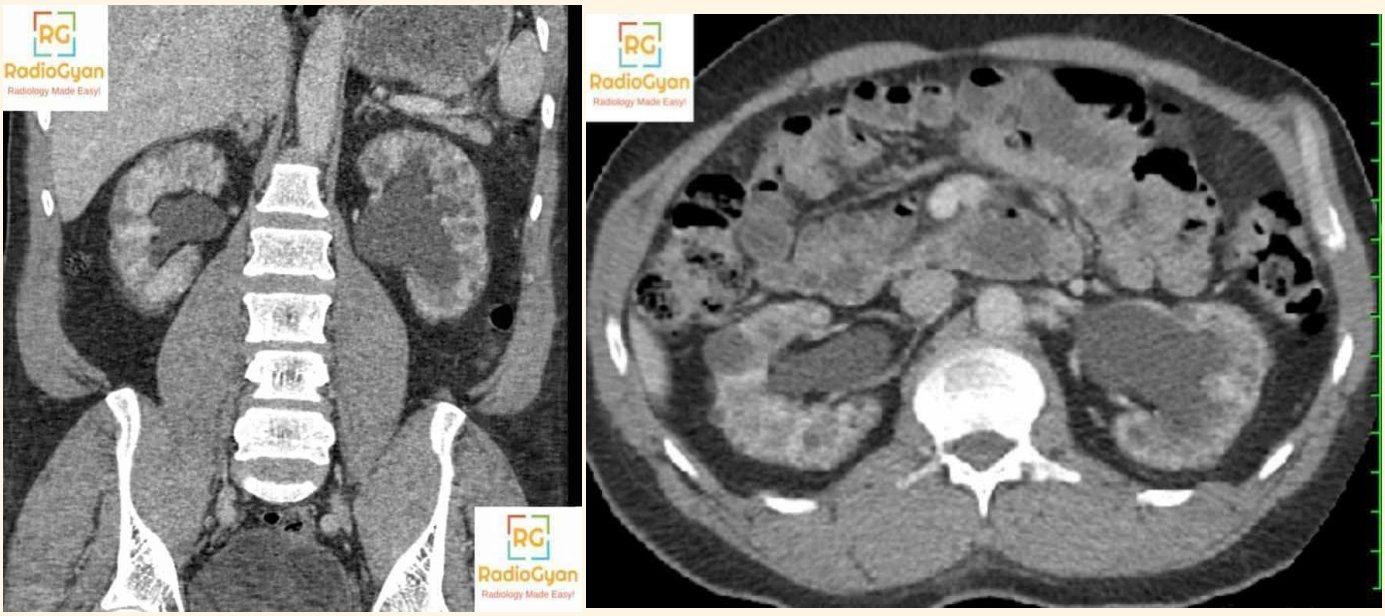
Dr. Amar Udare is a young and dynamic Radiologist. He is now doing his fellowship in Cross sectional imaging at Hamilton, Canada, He has developed a website - radiogyan.com - A free radiology website for radiology residents and professionals. He runs a Telegram group also, where thousands of Radiologists and Residents are members. Thanks a lot for helping the fraternity and spreading the knowledge. We are proud of you. Here is one of his cases.

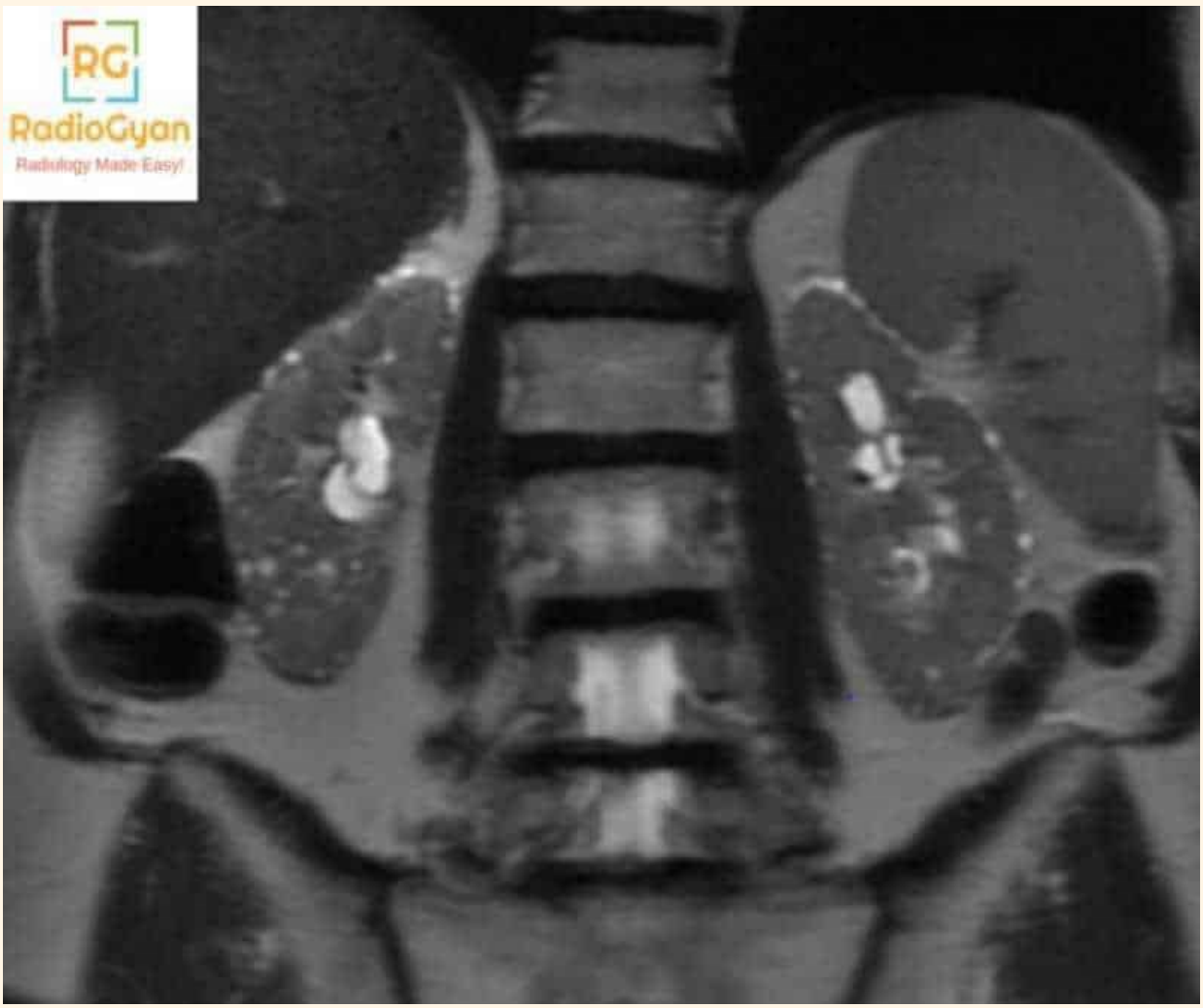
Lithium Nephropathy

Radiology features

- Multiple innumerable micro cysts randomly distributed in BOTH cortex and medulla or predominantly cortex are characteristic radiology findings in cases of lithium induced renal disease/ lithium nephropathy.
- Cysts are usually 1-2mm in diameter.
- Cysts arise from distal tubular structures and collecting ducts.
- Best seen on T2W MRI images.
- Cysts can also be seen on USG : Lithium nephropathy sonographic findings
- Differentials diagnosis with imaging features:
- Autosomal polycystic kidney (ADPKD)
- Nephromegaly with large cysts.
- Cysts are often of varying sizes and few of them are complicated.
- Glomerulocystic kidney disease:
- Patients are usually children or young adult.
- Cysts arise from Bowman space so ONLY in CORTEX of the kidney.
- Medullary cystic kidney disease:
- Cysts are present in the medulla and corticomedullary junction but spare the cortex.
- Acquired cystic kidney disease
- Seen in patients on long term dialysis.
- Cysts are NOT uniform in size although they affect both cortex and medulla.



Coronal and Axial CT images from a patient on long term Lithium therapy show innumerable micro cysts randomly distributed in both kidneys.



Clinical features and pathology of lithium nephropathy:

- **Lithium is used to treat unipolar major depression and bipolar affective disorders.**
- **Lithium toxicity spectrum includes:**
- **Acute intoxication.**
- **Nephrogenic diabetes insipidus / Polyuria-polydipsia syndrome: Harmless and reversible.**
- **Chronic renal disease (10-20 years): Chronic focal interstitial nephritis**
- **Approx. 30-60% of patients on long term lithium therapy can have cysts.**
- **Patients with chronic interstitial nephritis and typical cysts are at risk of developing end-stage**

References and further reading:

- **RadCases**
- **Genitourinary Imaging: Case Review**
- **Genitourinary Imaging: The Requisites (Requisites in Radiology)**
- **Lithium-induced Nephropathy Radiology**
- **Chronic Lithium Nephropathy: MR Imaging for Diagnosis**
- **Lithium Nephropathy USG renal disease.**

Dr. Ankur J. Shah

MBBS and DMRE from Civil Hospital, Ahmedabad

Consultant Radiologist and Head, Sadbhav Imaging Centre, a division of Gujarat Imaging Centre, Ahmedabad since 2005

Working in MRI and CT scan with focus on musculoskeletal imaging

Secretary of Musculoskeletal Society of India

Joint editor of Indian Journal of Radiology and Imaging

Obtained advanced musculoskeletal radiology training at Cincinnati, USA in 2010

Completed Fellowship in Cartilage MRI on Ultrahigh field 7.0 T MRI at Vienna in 2015

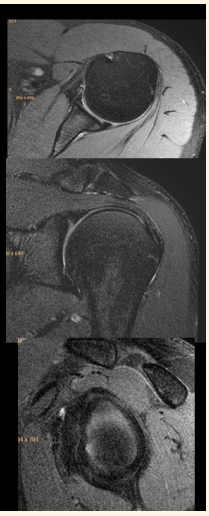
Has delivered lectures in national and international conferences

Has presented scientific papers and exhibits in various national and international conferences

MRI of Shoulder - Glenoid Labrum and labral variants

Glenoid Labrum

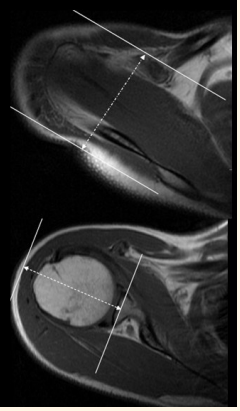
- The glenoid labrum is a fibrocartilagenous rim attached to the margin of bony glenoid
- It is the fibrous attachment of the glenohumeral ligaments and capsule to the glenoid rim
- It increases depth of the glenoid and provides stability to the joint
- Normal glenoid labrum is approx. 3 mm high and 4 mm wide



Imaging of Glenoid labrum

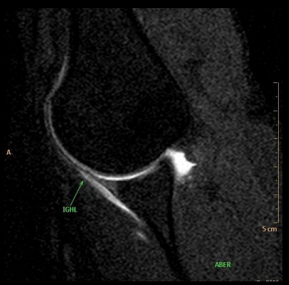
Planning of Sequences

- Axial images are planned on scout image
- Coronal Oblique images are obtained parallel to the supraspinatus tendon
- Sagittal Oblique images are obtained parallel to glenoid
- Rarely, oblique axial images can also be planned on oblique coronal and oblique sagittal images for better demonstration of labral tear as per labral clock



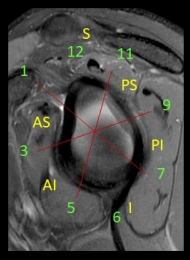
Special position scanning

- Sometimes, MR imaging is done after positioning the patient in Abduction and External rotation
- This causes stretching of the anterior band of inferior glenohumeral ligament and allows better evaluation of antero-inferior labral tears



Labral clock

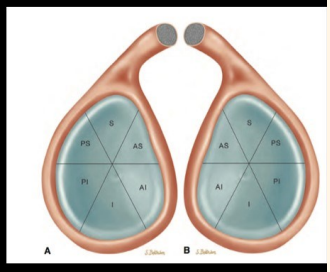
- The labral pathologies are described as per labral clock
- 12 o'clock is delineated by attachment of long head of biceps tendon at supraglenoid tubercle
- 1,3 and 5 o'clock are at anterior aspect – towards the coracoid process of scapula
- 7,9 and 11 o'clock are at posterior aspect – towards acromion process



Parts of labrum

Labral pathologies can also be described as per various parts of the labrum

- Superior labrum – 11 to 1
- Anterosuperior labrum – 1 to 3
- Anteroinferior labrum – 3 to 5
- Inferior labrum – 5 to 7
- Posteroinferior labrum – 7 to 9
- Posterosuperior labrum– 9 to 11



Labral variants

- Anatomical variations are very commonly seen in antero-superior and superior glenoid labrum – reported in as high as 13.5% of shoulder joints
- Most labral variants occur between 11 o'clock and 3 o'clock position
- It is extremely important to recognize different labral variants to avoid misdiagnosis of a labral tear

Labral variants
Morphological appearance

- Usually the labrum is triangular in shape on cross sectional imaging. But sometimes it can be rounded. Rarely it can also be blunted, cleaved, notched or flat
- All these different appearances can lead to false diagnosis of labral tear

Labral variants
Signal intensity

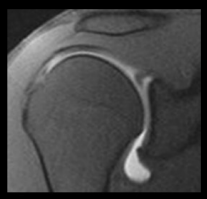
- Normal labrum usually appear homogeneously hypointense on T1W and T2W images. However, sometimes it can appear heterogeneous
- Subtle increased signal intensity areas can be normal variant or represent early labral degeneration without labral tear
- Postero-superior labrum commonly shows increased signal intensity on short TE images due to 'magic angle effect'

Labral variants
Attachments

- Normally the labrum is firmly attached to the posterior and inferior glenoid. Sometimes, there can be more medialized attachment of posterior glenoid labrum which can mimic as labral tear
- There can be variations in the attachment of anterior band of inferior glenohumeral ligament (IGHL)-labrum complex with the glenoid which can mimic labral tear

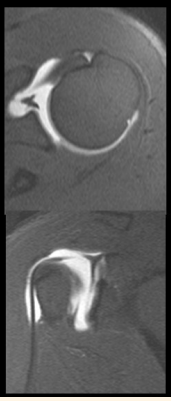
Labral variants
Sublabral sulcus or sublabral recess

- It is the most common labral variant classically located between 11 o'clock and 1 o'clock position
- It is a sulcus between the capsulolabral complex and the glenoid cartilage at the level of the long head of biceps tendon (LHBT) origin on the glenoid
- It is usually 1-2 mm thick. If the gap is > 5mm, think of SLAP tear
- It has smooth edges and extends medially towards the glenoid



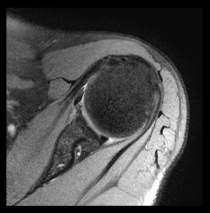
Labral variants
Sublabral foramen

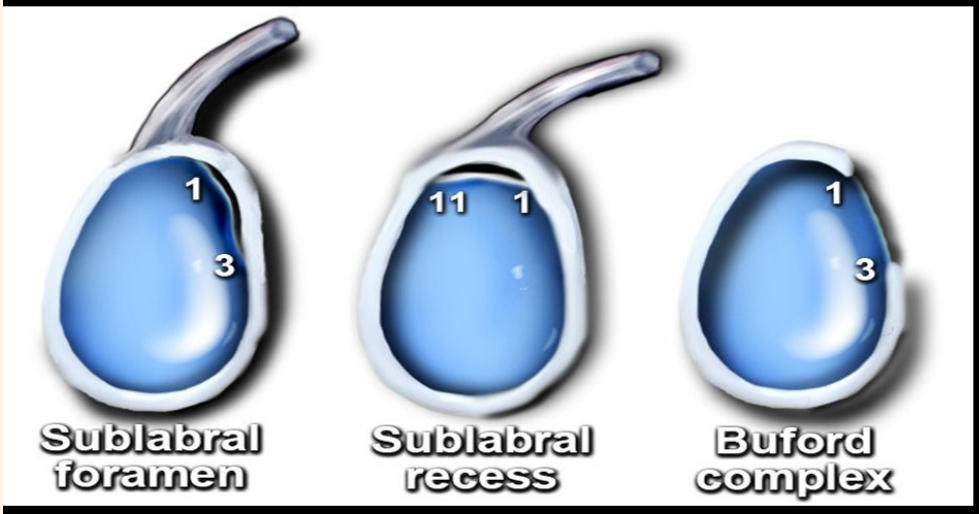
- It represents a focal detachment of glenoid labrum from the glenoid rim in antero-superior quadrant – typically located anterior to the attachment of LHBT between 12 or 1 to 3 o'clock position and does not extend posterior to the attachment of LHBT



Labral variants
Buford complex

- In Buford complex, there is absence of antero-superior glenoid labrum from 1 o'clock to 3 o'clock position
- This is usually associated with thickened and cord like middle glenohumeral ligament which is attached to the superior labrum





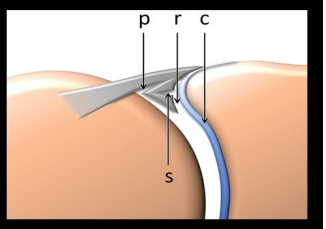
Courtesy: Radiology Assistant

Labral variants
Cartilage undercutting

- A thin linear layer of cartilage may extend between the antero-superior labrum and glenoid margin mimicking a labral tear
- Look carefully to differentiate the signal intensity of articular cartilage from that of fluid intensity which is present in labral tear

Labral variants
Pseudo-SLAP lesion

- Though not a very common variant, a pseudo SLAP lesion is a sulcus between the LHBT origin and superior glenoid labrum
- When this sulcus is deep, it can look like a SLAP lesion



p – pseudo SLAP tear
c – Cartilage undercutting
r – Sublabral recess or sulcus
s – SLAP tear

Courtesy: Radiographics, De Coninck T. et al.
https://doi.org/10.1148/rg.2016150029

Role of MDCT in Urology.

Dr. Viral K. Parekh, DMRD, DNB

INTRODUCTION:

Multidetector CT {MDCT} is also known as multislice, multichannel or multisection CT. The MDCT could be 16 slice, 40 slice, 64 slice and even 256 slice. The basic dictum is more the merrier. In our center, we are using a 64 slice MDCT scanner. The more the number of slices, faster is the scan time. These faster scan times result in decreased breath hold times with reduced motion artifacts and more diagnostic images. These scanners allow us to have increased volume coverage with thinner slice thickness [even fraction of a mm.], which further helps in obtaining volume data sets for 2D, 3D, Multiplanar [MPR] and maximum intensity projections [MIP]. Moreover by using MDCT, different image thickness can be obtained from the same acquisition data set. [3] Thus MDCT allows us to have increased number of slices with increased temporal resolution, increased spatial resolution. and Isotropic data acquisition.

The MDCT has wide application in many clinical conditions of kidneys and urinary collecting system; hence it is used in evaluation of following conditions:

1. Urolithiasis.
2. Characterization of small renal masses.
3. Display of arterial and venous supply of the kidneys similar to conventional angiography.
4. Demonstration of abnormalities of collecting system using 3D display technique.[1]

EXAMINATION TECHNIQUE:

1. Non-contrast CT

Non-contrast scans are obtained to

- Evaluate Urolithiasis.
- Detect acute haematoma.
- Obtain baseline density measurement of renal masses [6,7]

2. Contrast enhanced CT

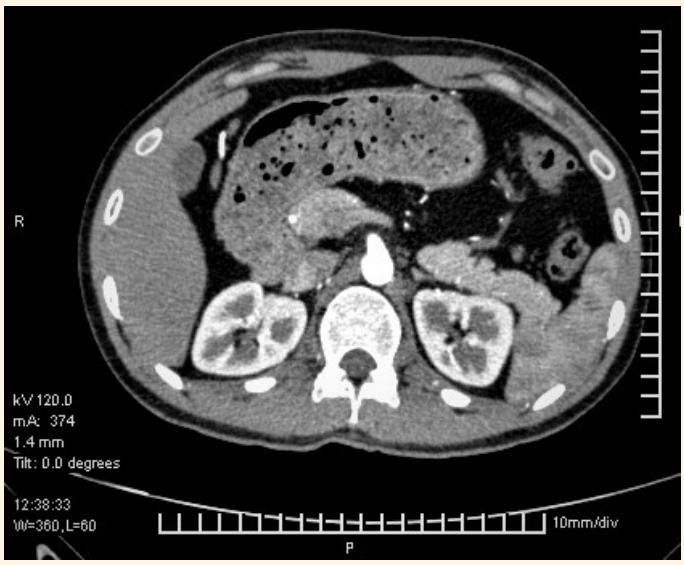
- Oral contrast medium

Positive oral contrast should not be used as it interferes with post processing

- IV contrast medium

For contrast enhanced phases the optimal timing depends on the volumes of the contrast medium, the rate of its administration and patient's cardiac output [1] With MDCT, the delay time must be adjusted properly relative to patients' contrast transit time. This can be done easily using a test bolus injection or automatic bolus triggering. [5] In our centre we use automatic bolus triggering.

- Phases of renal enhancement [6,9,10]
  - Arterial phase – 15 to 25 seconds after the bolus injection – to evaluate arterial anatomy. This phase is used for MDCT angiography.
  - Venous phase – 30 to 40 seconds after the injection and continues up to 60 seconds. This phase is used to evaluate venous anatomy. In this phase, there is intense enhancement of cortex while the medulla remains relatively less enhanced.
  - Nephrographic phase – 75 to 100 seconds after the start of contrast medium injection. During this phase the cortex and medulla enhance uniformly and contrast medium is yet to enter the renal collecting system. This phase is used to evaluate renal parenchyma and for detection of focal masses.
  - Delayed phase – Excretory or Urographic phase – begins 3 minutes after the start of the injection. This phase is used to evaluate the collecting system including renal pelvis and ureters. In our centre we routinely take the urographic series after 10 minutes.



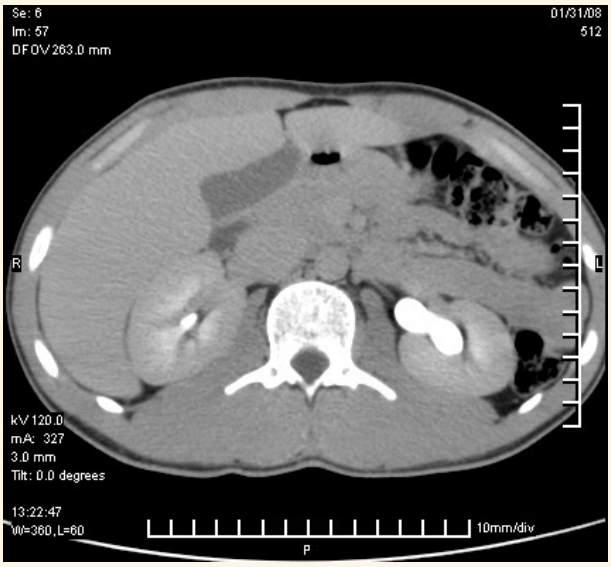


Fig 1a: The image demonstrates the kidneys in arterial phase. There is intense enhancement of the cortex but the medulla is less enhanced.

Fig1b: Excretory phase is shown in this image.

IMAGE PROCESSING AND POST PROCESING TECHNIQUES:

Four main 3D visualization techniques are used currently:

1. MPR – Multiplanar reformation

   Most commonly used [11]

   Represents simple reordering of image voxels

   A known limitation o MPR is that the visualized structures must be in the same plane. Because most structures are not in the same plane, a MPR can not be created that demonstrates the entire structure. To solve this problem curved Multiplanar [CMPR] reformations are used.[1]

2. MIP – Maximum Intensity Projection

   MIP displays the maximum voxel density along a line of viewer projection in a given volume [9]

   High density structure such as contrast filled vessels and the collecting system are demonstrated nicely in images, such as angiograms and urograms.

3. SSD – Shaded surface display

   SSD enable accurate 3D representations of anatomy, relying on the gray scale to encode reflections from an imaginary source of illumination.

4. VRT – Volume rendered technique

   With this technique, all attenuation values within a voxel are used to obtain the final image.

   Anatomic structure with different levels of opacity such as renal parenchyma, veins and arteries can be simultaneously demonstrated [9].

CLINICAL APPLICATIONS:

There are various clinical applications of MDCT in Urology. However, the MDCT [64 slice] stands out in evaluation of renal vessels. The various applications are as follows:

1. Evaluation of flank pain and urinary calculi.

The MDCT has become the standard method of evaluating the flank pain in the western countries. It has sensitivity and specificity as high as 97% and 96% respectively. [8] Using MDCT, a thin collimation [3-5 mm.] slices are obtained from the superior aspect of the kidneys through the symphysis pubis. This technique is simple and does not require ant preparation of administration of oral or IV contrast. Reconstructed images such as MPR and CMPR are useful in demonstrating the exact location of stones and their relationship to ureter.

2. Evaluation of inflammatory lesions of the kidney.

The main purpose of renal imaging is to obtain information regarding the nature and extent of the disease process and to identify any significant complications such as gas forming infection, abscess, and urinary obstruction. [8]. Gas, calculi, parenchymal calcifications and haemorrhage are demonstrated well with non contrast CT. Imaging features of inflammatory disease of the kidneys seen on MDCT are similar to those on single detector CT. [5] . MDCT is more useful than IVU or Ultrasound for the assessment of renal infection. [3, 4]

3. MDCT renal angiography.

In our centre, the commonest indication of MDCT is for Renal CT angiography. The main indications are for complete evaluation of renal transplant candidates and to rule out any renal artery stenosis in patients who have suspected renal artery stenosis.

Renal donor evaluation.

In our centre the protocol used for evaluation for potential renal donor is as follows:

1. First of all, a scout view is obtained.
2. A plain study is done from the domes of the diaphragm to symphysis pubis to rule out any renal calculus and further planning of the procedure. If a calculus or any abnormality is seen on plain study, we do not proceed further.
3. If the plain study is unremarkable then we proceed with the renal angiography. A complete series taken in the arterial phase followed by venous phase.
4. The last part of the process is to have a MDCT urography , which demonstrates the renal collecting system, whole length of ureters and urinary bladder.
5. After acquiring all these data, post processing is done to obtain VRT, MPR, CMPR and MIP images.

Evaluation of renal hypertension.

The commonest cause of renal hypertension is atherosclerosis [almost 90%], followed by Fibromuscular dysplasia[10%] and renal artery stenosis [5%]. The sensitivity and specificity of MDCT is around 92% and 99% for the detection of haemodynamically significant arterial stenosis [13].

Other conditions :

MDCT angiography is useful for evaluation of other conditions also, such as

1. Renal artery aneurysm.
2. Renal vein thrombosis
3. Diagnosis of crossing vessels in pelvi-ureteric junction obstruction.
4. Congenital anomalies and normal variants.
5. Various types of vascular, parenchymal and urinary tract anomalies including accessory renal arteries, aberrant renal artery origins, anomalous renal veins, ptotic malrotated and horseshoe kidneys, urinary tract duplication PUJO, and ectopic ureteroceles may be detected incidentally during MDCT studies.

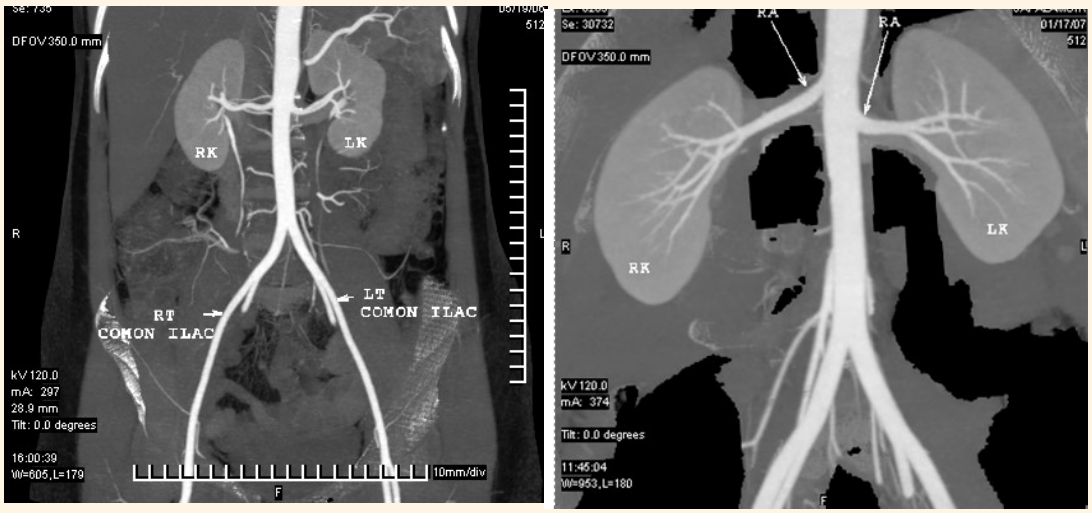


Fig 2 a&b: MIP image demonstrates normal renal angiogram in two different patients.

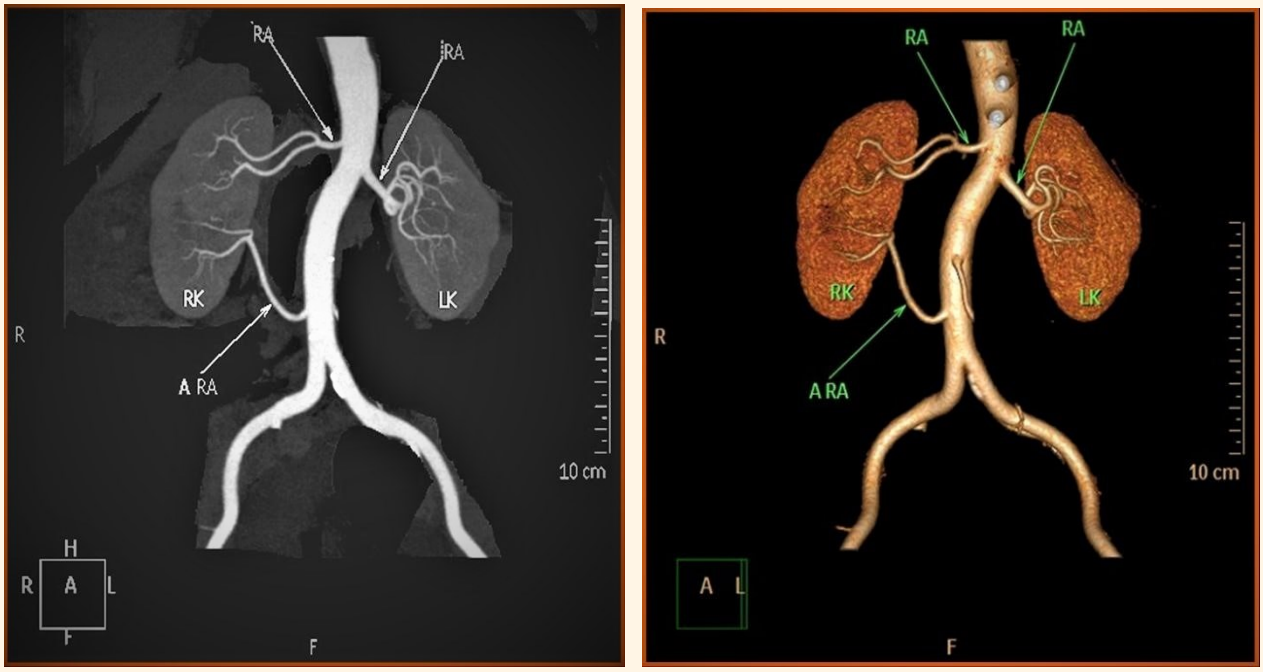


Fig 3 a&b: MIP and VRT images display an accessory right lower polar artery.

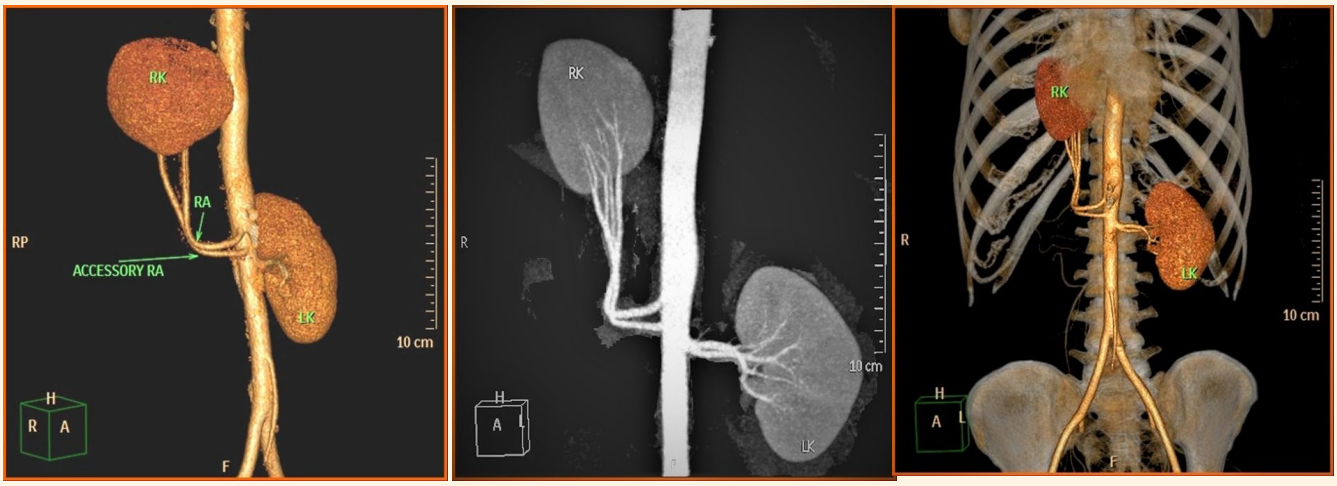


Fig 4a to c: MIP and VRT images demonstrate an ectopic right kidney with an accessory right renal artery.

4. MDCT Urography

Conventional Intravenous Urography is still widely used technique for evaluation of Urinary tract. It can evaluate the intraluminal filling defects and mucosal irregularities quite well but has limited role in the evaluation of small masses and cysts. Its role is limited in the evaluation of inflammatory conditions like lobar nephronia. Whereas, MDCT enables faster data acquisition and higher resolution images. The entire urinary tract is visualized in one breath hold and its initial data acquisition enables better quality reconstructed and reformatted coronal images similar to IVU. [12]. CT urography can demonstrate not only urinary tract lumen but also the walls of urinary tract and its surrounding structures.

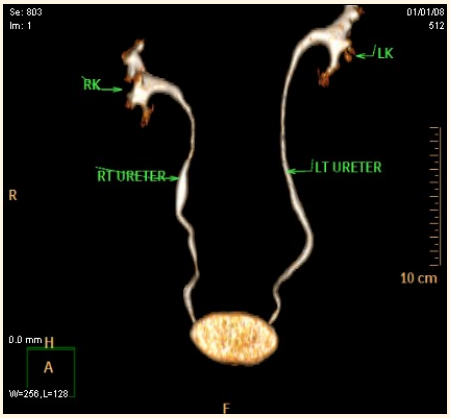


Fig 5: A VRT image of Urography shows the complete anatomy of Urinary tract.

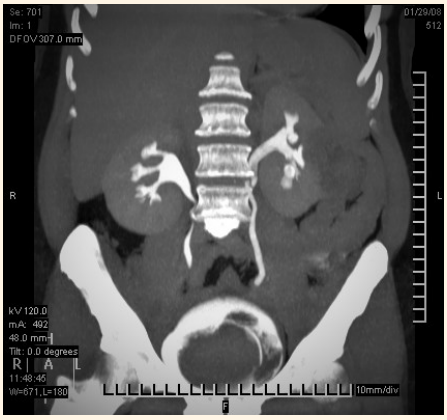


Fig 6: MDCT Urography shows a filling defect in urinary bladder.

5. Evaluation of renal masses and cysts.

MDCT has very high sensitivity and specificity in the evaluation of different types of benign renal masses and cysts. The MDCT can demonstrate the perinephric spread and local extension of malignant lesion very well and venous spread of tumors is also shown very efficiently. 3D CT combined with CT angiography has the potential to provide all the critical information needed to plan the required surgical procedure. These images can be viewed in multiple planes and orientations to define the tumor and its relation to the renal surface, the collecting systems and adjacent organs. [15]

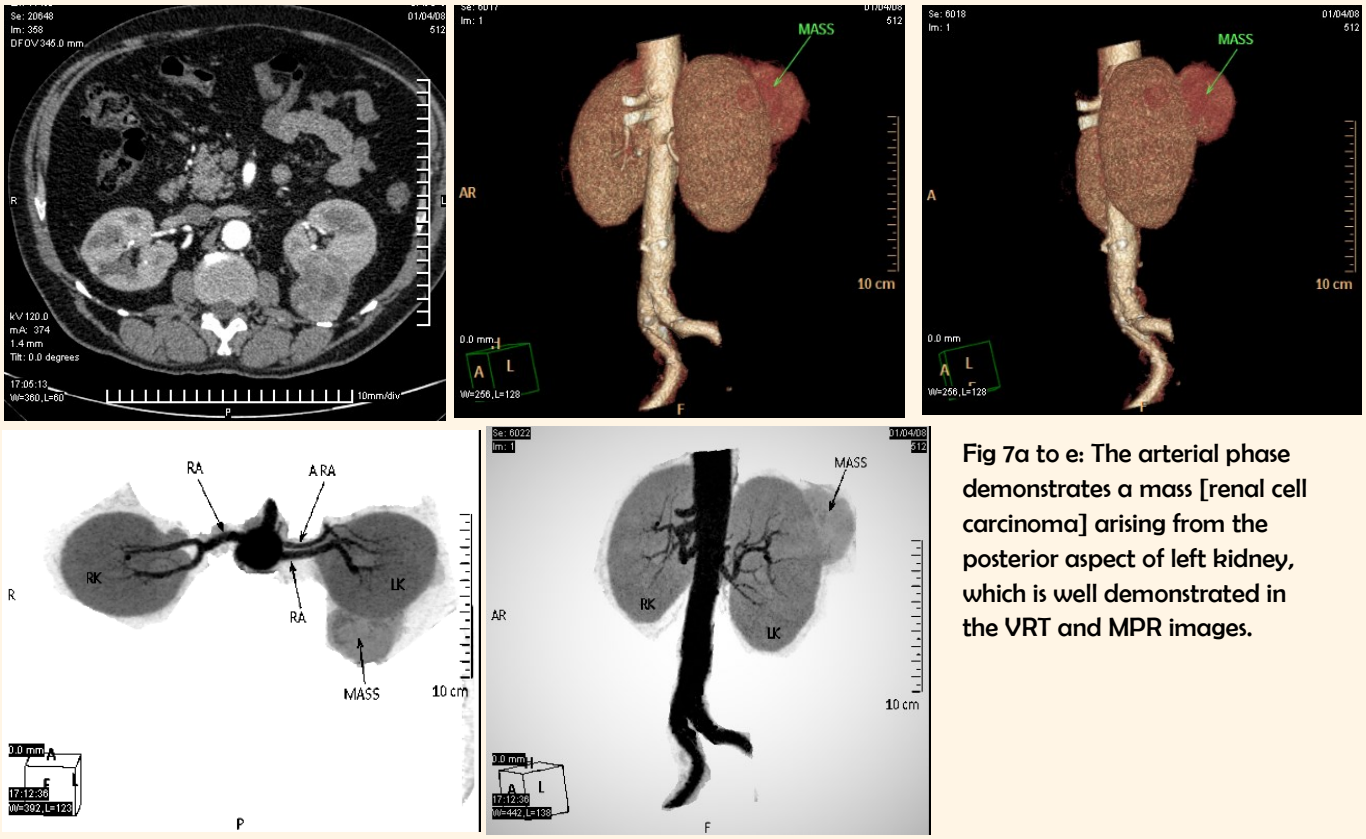


Fig 7a to e: The arterial phase demonstrates a mass [renal cell carcinoma] arising from the posterior aspect of left kidney, which is well demonstrated in the VRT and MPR images.

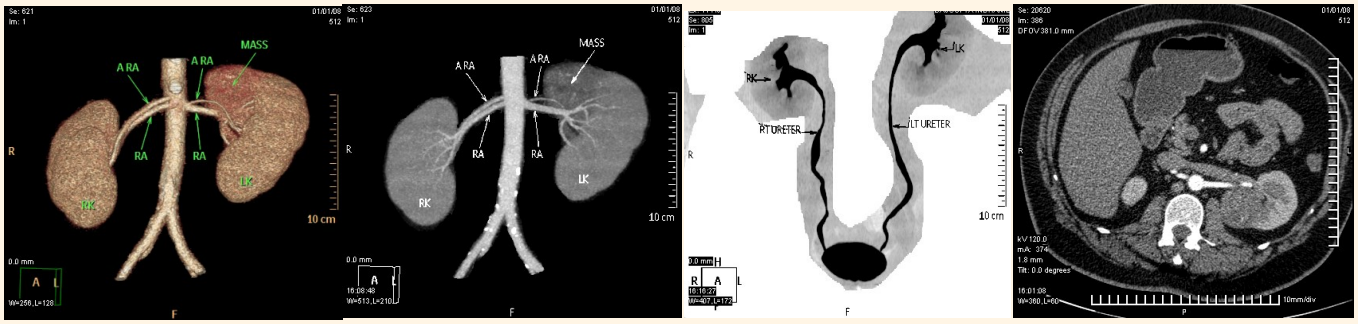


Fig 8 a to d: A case of renal cell carcinoma. The renal mass is well visualized in the medial aspect of left kidney in the arterial phase. The VRT and MIP images also demonstrate the lesion and its relation to arteries. The MDCT IVU demonstrates that the lesion is not involving the collecting system.

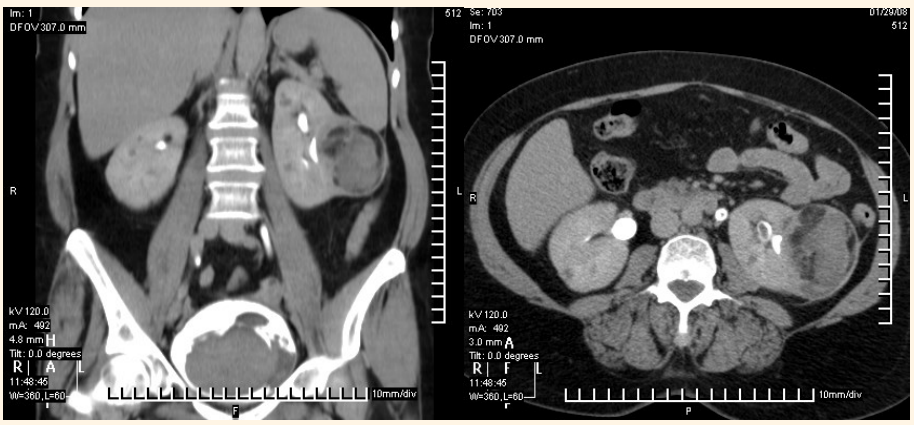


Fig 9 a & b show a large angiomyolipoma in left kidney.

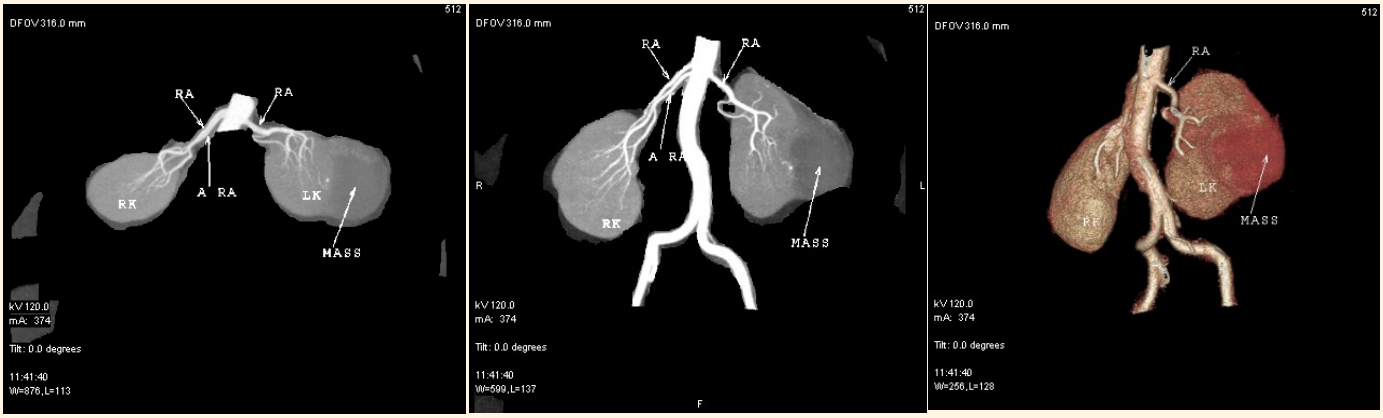


Fig 9 c to e: MRP. MIP and VRT images show a large angiomyolipoma in left kidney.

CONCLUSION:

MDCT provides the complete package for evaluation of Urinary tract. It allows superior image quality, deceased examination time and the ability to perform complex multiphase vascular and 3D examinations. In near future, CT urography rather than IVU will be used to evaluate patients with urinary tract symptoms. However, examination should be tailored to specific clinical indication to reduce radiation dose.

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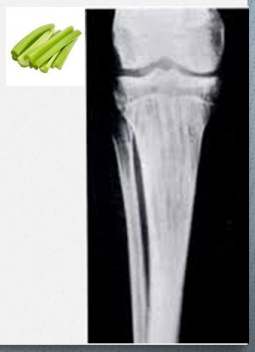
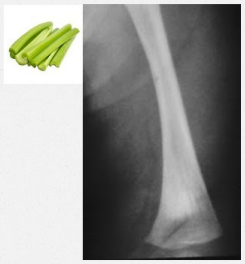
MSK Radiology Sign-Box

- Sign: '**Celery Stalk metaphysis**'
- Seen in Osteopathia Striata (OS) and congenital rubella. Seen rarely in CMV, Toxoplasma, Syphillis.
- Dense linear striations extending from metaphysis to diaphysis of long bones.
- OS: X linked dominant inheritance
- OS associations: Macrocephaly & cranial bone sclerosis.



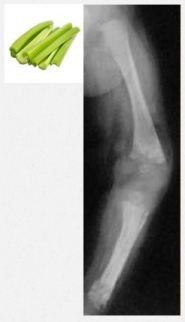
MSK Radiology Sign-Box

- Sign: '**Celery Stalk metaphysis**'
- Seen in Congenital rubella.
- Dense linear striations extending from zone of provisional calcification to diaphysis of long bones.
- Clavicle is also involved with features of osteitis
- Caused by Rubella virus which belongs to Togavirus family and Rubivirus genus
- Bony lesions are limited to first few weeks of life.



MSK Radiology Sign-Box

- Sign: '**Celery Stalk metaphysis**'
- Rarely seen in Congenital syphilis.
- Metaphysitis and Periostitis are common features.
- Widening of provisional zone of calcification, serrations and adjacent osseous irregularity.
- Saw toothed appearance of metaphysis in syphilis
- Wimberger sign in proximal tibia.



The CO-RADS classification is a standardized reporting system for patients with suspected COVID-19 infection. This is a classification system for radiologists proposed by Dutch Radiological Society.

CO-RADS		
CO-RADS	Level of suspicion	CT findings
CO-RADS 1	No	Normal or other non-infectious lesions.
CO-RADS 2	Low	Abnormalities consistent with infections other than COVID-19
CO-RADS 3	Intermediate	Unclear whether COVID-19 is present
CO-RADS 4	High	Abnormalities suspicious for COVID-19
CO-RADS 5	Very high	Typical COVID 19
CO-RADS 6	PCR positive	

CT Severity Scoring

Method One:

The TOTAL SEVERITY SCORE is a semi-quantitative scoring system used to estimate the pulmonary involvement of COVID19 related abnormalities on the basis of the area involved. Each of the five lung lobes is visually scored on a scale of 0 to 5 with:

Score	Involvement
0	None (no involvement in lobe)
1	< 5% of lobe
2	5%- 25% of lobe
3	26%- 49% of lobe
4	50%- 75% of lobe
5	>75% of lobe

The total CT score is the sum of the individual lobar scores and ranges from 0 (no involvement) to 25 (maximum involvement).

Major CT findings in COVID19 as defined by the Fleischner Society Glossary include ground-glass opacity (GGO), crazy-paving pattern, and consolidation.

Method Two: CT Severity Score - CT - SS

According to the anatomical structure, the 18 segments of both lungs were divided into 20 regions, in which the posterior apical segment of the left upper lobe was subdivided into apical and posterior segmental regions, while the anteromedial basal segment of the left lower lobe was subdivided into anterior and basal segmental regions.

The lung opacities in all of the 20 lung regions were subjectively evaluated on chest CT using a system attributing scores of 0, 1, and 2. The CT-SS was defined as the sum of the individual scored in the 20 lung segment regions, which may range from 0 to 40 points.

0	**No parenchymal opacification**
1	**< 50% involvement**
2	**> 50% involvement**

Form	Score
Mild	**< 20**
Severe	**> 20**

References:
Ran Yang*, Xiang Li*, Huan Liu, Yanling Zhen, Xianxiang Zhang, Qiuxia Xiong, Yong Luo, Cailiang Gao, Wenbing Zeng
Published Online:Mar 30 2020https://doi.org/10.1148/ryct.2020200047 , Radiology, RSNA.

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A Platform For Radiology Education & Interaction

Calcutta Academy of Radiology was formed on international day of Radiology in 2019, that is on 8th. November, 2019 to promote Radiology education, keeping in mind Residents as well practicing Radiologists.

Since then we are on WhatsApp and Telegram, where thousands of cases have been discussed by members from all over the world and in the process we are sharing our experiences and helping each other. These social media platforms have turned out to be great learning tools.

We had organized a half day CME also on GI Radiology in February, 2020. We have plans to organize more such CME programmes in future when world recovers from this ongoing pandemic.

We are on YouTube also where we regularly post teaching videos and in the process try to propagate Radiology as much as possible.

We are on WhatsApp and Telegram

Next issue will be published in October 2020

We will be bringing out such Newsletters with a frequency of one issue every two months. So, next issue will be published in October, 2020.

We are hereby inviting good interesting cases and original work from our fellow Radiologists, which will be published on merit basis.

So, I request all of you to contribute to this Newsletter. Please send your material in Word format with good quality images. Please send your photograph and details of your place of work with email address also.

Your material should reach us by 15th. Of September, 2020. You can send the word file to our abovementioned email address or you can WhatsApp it to above-mentioned three phone numbers.

We are also inviting 8-10 minutes teaching Videos for our YouTube channel. If your video is of good quality and contains good teaching material, we will publish it on our channel. Please note that it should contain original teaching material.

So friends, utilize your time during this lockdown and engage yourself in academic activities and send it to us. We will be more than happy to publish it, of course it should be quality material.

Our Telegram group is lagging behind in academic activities as compared to two WhatsApp groups, so I request all of you to join our Telegram group. Since, WhatsApp restricts the number of members to 256 only, whatever activity going on there is not helping the whole Radiology community.

Telegram can add up to whopping 200,000 members. So, if we post our study material there; it will reach to and benefit huge number of members.

So friends, take care and be safe.

So, see you all in next issue of CAR newsletter.

So long,

Anup Sadhu, Bijon Kundu and Viral Parekh.