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Radiodiagnosis

A STUDY FOR IMAGING OF ADRENAL MASSES IN A TERTIARY CARE CENTRE

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ABSTRACT The adrenal gland is involved by range of neoplasms, including primary and metastatic malignant tumors. Differentiation of benign and malignant lesions are crucial since it would greatly affect treatment and prognosis. This is prospective study include 50 patients with abdominal pain, lump or patients in whom adrenal lesions are picked up on CT scan or USG study. Out of 50 cases studied 32% were of benign etiology and 68% were of malignant etiology. There were more number of malignant lesions as ours is tertiary institute. Out of 50 patients 16 cases are neuroblastoma, 12 cases adrenal metastasis, 10 cases are adrenal adenoma, 5 cases adrenocortical carcinoma, 2 cases adrenal cysts, 2 cases pheochromoc ytoma, 1 case adrenal myelolipoma, 1 cases adrenal adrenal lipoma and 1 case is adrenal lymphoma.

Summary : In this article we have provided comprehensive look at characterization of various adrenal masses. Imaging will not always provide one to arrive at definitive diagnosis, attention to these findings provide a road map to guide image interpretation.

KEYWORDS : Adrenal gland, Adrenal gland neoplasm, neuroblastoma, adrenal adenoma.

INTRODUCTION

The adrenal glands are for their size, among the most important structures in the body. In 1563, Bartholomeus Eustachius was the first anatomist to give a detailed description of the human adrenal glands. He described gland as "glandulae renibus incumbentes". Their function was quite unknown until 1855, when Addison first described the syndrome resulting from their destruction. Adrenal glands are composed of cortex and medulla.

Adrenal medulla is a part of chromaffin system.
Chromaffin system is made up of cells, which have an affinity for certain salts of chromic acid. Such cells are called the chromaffin cells or pheochromocytes. These cells secrete adrenalin and noradrenalin.

AIMS AND OBJECTIVES

- To study the age and sex incidence of various adrenal lesions.
- To evaluate the role of radiology in diagnosis of various adrenal lesions in children and adults.
- To arrive at a histopathological diagnosis of a mass by obtaining a biopsy under USG or CT guidance whenever possible.

MATERIAL AND METHODS

A study of 50 cases was done on clinical suspicion from paediatric and surgical departments of Civil Hospital, Surat during period of December 2018 to November 2019. Depending on indications, all patients underwent radiological examinations and non radiological investigations like histopathological and biochemical study were also carried out.

A guided biopsy from mass under USG guidance was taken whenever possible for histopathological examinations.

The radiological examinations carried out in these patients are as follow:

Routine X-ray chest PA view was taken in almost all these cases.USG was carried out in almost all patients. CT scan was performed in most cases when the investigation was accessible to the patients.

MRI scan was performed using IV contrast material (Gadolinium deglutinate).No serious contrast media reactions were noted.

OBSERVATION AND ANALYSIS

50 cases of adrenal lesions were studied and necessary radiological investigations were undertaken.

(A) DISTRIBUTION OF PATIENTS ACCORDING TO AGE AND GENDER GROUP.

Age	No. of cases	Percentage
00-05 years	15	30
06-25 years	04	08
26-45 years	17	34
46-65 years	11	22
>66 Years	03	06
Total	50	100 %
GENDER		
Male	29	58
Female	21	42

In present study maximum no. of cases were reported in age group of 25-45 years amounting 34%, 30% from 00-05 years of age and 20% from age group 45-65 years.

Males were more affected than females. Out of 50 cases, 29 were males (58%) and 21 females (42%).

[C] NATURE OF ADRENAL LESIONS

Lesion	No. of cases	Percentage
Benign	16	28
Malignant	34	72

In present study most cases were found malignant (34 cases) amounting to 68% and rest 7 cases were benign 32%.

[D] INCIDENCE OF BENIGN LESIONS (N= 16)

Lesions	No. of patients	Percentage
Adenoma	10	63
Cyst	2	12.5
Pheochromocytoma	2	12.5
Myolipoma	1	6
Lipoma	1	6
Total	16	100

[E] INCIDENCE OF MALIGNANT LESIONS (N= 34)

Lesions	No. of patients	Percentage
Neuroblastoma	16	47
Adrenal metastasis	12	35
Adrenocortical Carcinoma	5	15
Lymphoma	1	3
Total	34	100

[F] AGE & GENDER DISTRIBUTION OF BENIGN LESIONS (N=16)

Age	Male %	Female %	Total (%)
0-5 years	1 (6%)	0 (0%)	1 (6%)
6-25 years	0 (0%)	2 (13%)	2 (13%)
26-45 years	4 (25%)	3 (19%)	7 (44%)
46-65 years	4 (25%)	1 (6%)	5 (31%)
> 65 years	1 (6%)	0 (0%)	1 (6%)
Total	10 (62%)	6 (38%)	16 (100%)

[G] AGE & GENDER DISTRIBUTION OF MALIGNANT LESIONS (N=34)

Age	Male %	Female %	Total (%)

0-5 years	8 (23%)	6 (18%)	14 (41%)
6-25 years	0 (0%)	2 (6%)	2 (6%)
26-45 years	7 (20%)	3 (9%)	10 (29%)
46-65 years	3 (9%)	3 (9%)	6 (18%)
> 65 years	1 (3%)	1 (3%)	2 (6%)
Total	19 (55%)	15 (45%)	34 (100%)

[H] INCIDENCE OF ADRENAL LESIONS

No.	Lesion	No. of cases	Percentage
01.	Neuroblastoma	16	32
02.	Adrenal metastasis	12	24
03.	Adrenal adenoma	10	20
02.	Adreno cortical Carcinoma	5	10
05.	Adrenal cyst	2	4
06.	Pheochromocytoma	2	4
07.	Adrenal myelolipoma	1	2
08.	Adrenal lipoma	1	2
09.	Adrenal lymphoma	1	2

No. of cases were of neuroblastoma (16 cases) 32%, adrenal metastasis (12 cases) 24%, Adrenal adenomas (10 cases) 20% followed by adeno cortical carcinoma (5 cases) 10%. 2 cases each of adrenal cyst (4 %) and 2 cases of pheochromocytomas 4 % were found.

[I] ANALYSIS OF VARIOUS ADRENAL LESIONS

[1] NEUROBLASTOMA

Incidence of neuroblastoma was 16 out of 50 cases. Out of 16 cases, 9 were males and 7 female. 12 cases out of 16 were below 4 years. 4 cases were above 4 years.

a) PLAIN X-RAY (CHEST/ABDOMEN)

- Soft tissue mass with displacement of bowel loops**.**
- Pleural effusion in 3 cases out of 16 cases.
- One had bilateral pleural effusion and one patient had lung metastasis.
- Soft tissue mass with irregular and amorphous calcification was present in 10 out of 16 cases.

b) USG

- Most of these had heterogenous echogenicity with internal cystic areas and calcification was present in 68.75 % (11 out of 16 cases).
- Eleven cases are presented with involvement of adjacent structutes (e.g. IVC, aorta etc.)
- Lymph node enlargement was present in 75% cases, all cases had paraaortic and 2 patients had pelvic lymph node enlargement.

c) CT

- 6 showed low mixed attenuation mass with internal cystic areas which showed enhancement on IV contrast injection in almost all cases.
- Calcification was present in 62.5 % cases (10 out of 16 cases).
- Lymph node enlargement was in 12 cases (75%), paraaortic nodes present in all cases and pelvic nodes present in 2 cases.
- 1 patient of liver metastases was found.
- 11 cases show involvement of adjacent structutes (e.g. IVC, aorta etc.)
- One case presented with metastases in brain.

Metastases

- Metastases were in all 4 cases involving lower extremities and skull.
- 2 cases showed retrobulbar metastasis causing proptosis of both eyeballs.
- 1 case showed presence of brain metastasis on CT.
- 1 case of liver metastases was found.
- Lymph node enlargement was found in 12 cases (75%).

[2] ADRENAL METASTASES

- Adrenal metastases from other primary tumors was 24% between 35 to 70 years (12 out of 50 cases)**.** Out of 12, male patients were 8 and female were 4.
- All 12 cases had a known primary tumour elsewhere out of these, 7 cases had primary carcinoma lung.
- 6 patients had bilateral and 6 patients with unilateral metastasis.
- One case was a known case of bilateral undescended testis with carcinoma left testis and was operated. There was also adrenal metastasis from urinary bladder, breast, colon and esophagus seen, one patient each.
- Most cases presented with chest pain, cough and breathlessness.

a) PLAIN X- RAY (CHEST/ABDOMEN/ SKELETAL SURVEY)

- 4 patients presented with lung metastasis and 3 patients with pleural effusion.
- 1 patient with right paratracheal nodal mass.
- Soft tissue mass was present in 8.3% (1 out of 12 cases) on plain abdomen x-ray.
- Skeletal survey revealed metastasis involving vertebrae and extremities in 8 case (66.6%).

b) USG

- 8 lesions were hypoechoic and 4 were heterogeneous echotexture with no calcification.
- Para aortic lymphadenopathy was present in 4 cases (33.33%).
- 5 cases with liver metastases were found.
- Aorta was engulfed by nodes in 1 case.

c) CT

- Out of 12, 10 patients appeared hypodense, ill defined, 2 patients showed mixed appearance and well defined margins.
- No calcification was noted.
- Lymphnodes were present in 4 case (33.3%), para aortic as well as paratracheal nodes.
- Aorta was engulfed by para aortic nodes in 1 case (17%).
- 6 cases showed unilateral mass and 6 cases showed bilateral masses.

[3] ADRENO CORTICAL Ca

Incidence adreno cortical Ca was 10 %(5 out of 50 cases), female predominance. Out of 5 cases 3 were female (60%) and 2 were males (40%) between 14 to 55 years. Mostly all of them presented with lump and pain in abdomen and fever.

a) PLAIN X-RAY (CHEST/ABDOMEN)

- Chest films appeared normal.
- All patients presented with soft tissue mass and displacement of bowel loops on plain film of abdomen.

b) IVU

- Soft tissue mass with displacement of kidney on affected side was present.
- Displacement of pelvi-calyceal system was present case.

c) USG

- In all unilateral lesions were found.
- Liver metastases was found in two cases (40%) one each on right and left side.

d) CT

- In present study irregular contrast enhancement was present in all 5 cases (100%).
- No midline crossing
- 2 cases of liver metastasis, 1 with primary tumour arises in left adrenal gland.

Metastases

- In 2 cases metastases to liver and 1 case metastasis in upper extremity was found.

[5] ADRENAL CYST

- Incident of cyst was 4% (2 out of 50 cases), 1 were male (50 %) and 1 were female (50%).

a) PLAIN X-RAY (CHEST/ABDOMEN)

- soft tissue mass with displacement of bowel loops in 1 case (50%).

USG:

- Echogenicity: In 1 case, it was anechoic (50%) and in the one case, it was mixed density mass with internal echoes (50 %).

b) CT:

- **Density:** In 1 cases, cystic (50%) and in one mixed density mass with internal echoes (50 %).

[6] ADRENAL ADENOMA

- Incident of adrenal adenoma was 20 % (10 out of 50 cases).

- Both males and females had equal incidence, 50 % each.
- Adenoma was found in cases of Ca breast and ALL, one for each.

a) PLAIN X-RAY (CHEST/ABDOMEN):
- 4 cases with soft tissue mass and displacement of bowel loops (40%) on plain abdomen film.

b) IVP :
- It was performed in 1 case (10 %).
- Kidney was found displaced with displacement of pelvi calyceal system in one case (10%).

c) USG :
- Unilateral on 9 cases, 6 cases on right side & 3 cases on left side, 1 cases with bilateral adenoma.
- Changes of fatty liver in one case (10%).

d) CT :
- Hypodense lesion in 6 cases (60 %) and heterogonous in 4 cases (40 %).
- Nephrocalcinosis in 1 case (10%).
- Changes of fatty liver in 1 case.
- Kidney displaced in 1 case (50 %).

[6] PHEOCHROMOCYTOMA
- Incidence of pheochromocytoma was 4 % (2 out of 50 cases), between 25-35 years.
- It found in both male and female.

a) PLAIN X-RAY (CHEST/ABDOMEN):
- Both cases presented with soft tissue mass with displacement of bowel loops in x-ray abdomen film.

b) USG :
- Unilaterally present (100%).
- 50 % of right side (1 out of 2 cases) and 50 % of left side (1 out of 2 cases).

Echogenicity:
- Hypoechoic in both cases (100%).

c) CT :
- It was performed in both cases (100%).
- Hypodense lesion (100%) with irregular margins in both cases (100%).

[7] ADRENAL MYELOLIPOMA
- Incidence was 2% in present study, found in a male patient aged 61 years, presented with palpable lump and pain in abdomen.

Modalities:
a) PLAIN X-RAY ABDOMEN:
- Soft tissue mass with displacement of bowel loops.
- No calcification seen.

b) PLAIN X-RAY CHEST: Normal.
c) USG :
- Left sided mixed echogenic mass.
- No calcification, nodes or metastasis seen.

d) CT :
- Mixed density mass (fatty density present) with irregular margins.
- No midline crossing.
- Left kidney displaced.

[8] ADRENAL LIPOMA
- Incidence was 2% in present study.
- Found in male aged 55 years.
- Patient was known case of carcinoma head pancreas presenting with lump in abdomen and pain in abdomen.

Modalities
a) PLAIN X-RAY ABDOMEN
- Soft tissue mass left side, No calcification

b) PLAIN X-RAY CHEST
- Normal

c) USG
- Left sided echogenic mass.
- No calcification or nodes seen.
- GB distended, lower end of CBD dilated.
- Hypoechoic mass in region of head of pancreas.

d) CT
- Well defined, fatty density left sided mass , no calcification.
- Left kidney displaced.
- GB, CBD dilated, Mass in head pancreas. (k/c/o Ca pancreas)

[9] ADRENAL LYMPHOMA
- Incidence was 2% in present study.
- Found in male aged 56 years.
- Patient was a known case of lymphoma, presented with lump and distention of abdomen.

Modalities
a) PLAIN X-RAY CHEST/ABDOMEN
- Presence of bilateral soft tissue mass, with displacement of bowel loops.
- Right paratracheal glands.

b) USG
- Multiple hypoechoic areas in both kidneys and hypoechoic mass in both adrenals
- Para aortic lymphadenopathy.
- Displacement of IVC.

c) CT
- Mixed density masses involving both adrenals and both kidneys.
- Para aortic lymphadenopathy.
- Displacement of IVC.

Metastases
- Bone survey appears normal.

DISCUSSION

Out of 50 cases studied 32% were of benign etiology and 68% were of malignant etiology. There were more number of malignant lesions as ours is tertiary institute for cancer. Most (28%, fourteen out 50 cases) of the malignant lesions of the adrenal lesions in my study are less than 5 yrs, all 14 cases are of neuroblastoma. Neuroblastoma is most common extracranial solid tumour of childhood. Out of 16 cases of neuroblastoma 9 were male and 7 were female, 12 cases were found in age group of less than 4 years of age accounts for 75 %. 10 cases were presented with calcification on CT scan imaging.

In my study, 5 cases of adrenocortical carcinoma 3 were female and 2 were male, age ranges between 14 years to 55 years

Most common benign lesion was adrenal adenoma, out of 16 cases 10 were adenoma accounting for 63%, commonly in 30 to 70 years. Adrenal metastasis, out of 12 cases, 8 cases were male & 4 cases of female, age ranges 35 to 70 years were present.

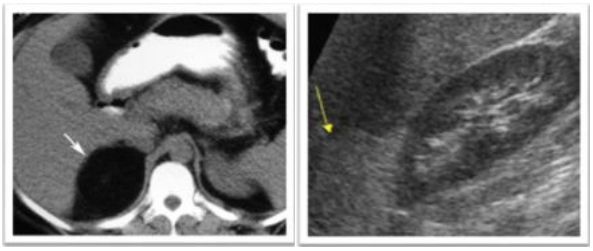
Out of 12 cases of adrenal metastasis, 7 with bilateral and 5 with unilateral adrenal masses: Out of 12 cases of adrenal metastasis, 8 patients with primary tumour origin from lung.

2 cases of phaeochromocytoma was found, one was male and one female case. Adrenal myelolipoma is presented in 2% of cases, which is rare tumour

ADRENAL MYELOLIPOMA

Fig.1: A) CECT of abdomen of 61 years male patient shows well defined fat density lesion in left adrenal region. B) USG of another patient shows well defined heterogeneous lesion in left adrenal region. Echogenic area in the lesion is due to fatty component.

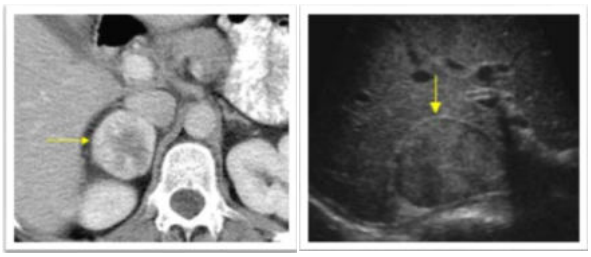
ADRENAL LIPOMA



(A) (B)

Fig.2: A) CECT of abdomen shows 50 years male with fat density lesion in right adrenal region. B) USG of abdomen of similar patient shows well defined echogenic lesion in right adrenal region. Case of lipoma of right suprarenal region.

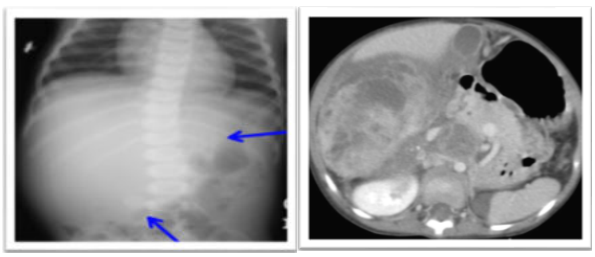
ADRENAL PHEOCHROMOCYTOMA:



(A) (B)

Fig.3: A) CECT of abdomen shows 35 years female patient was presented with heterogeneously enhancing soft tissue density lesion in right adrenal region with internal non-enhancing areas. B) USG image of another patient of 25 years old shows well defined hypoechoic lesion in right adrenal region. Patient is known cases of phaeochromocytoma.

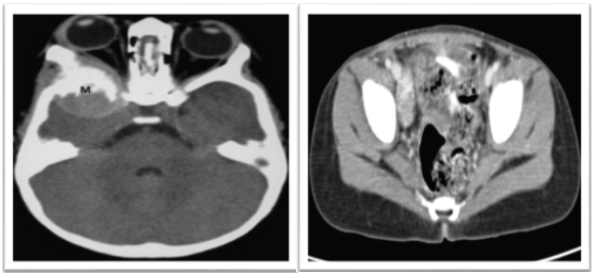
ADRENAL NEUROBLASTOMA



(A) (B)

Fig.4: A) X-ray abdomen of 2 years male patient shows large soft tissue mass lesion in right adrenal region. B) CT image of similar patient shows large heterogeneously enhancing soft tissue density lesion with internal necrotic areas in right adrenal region. HPE: Right neuroblastoma.

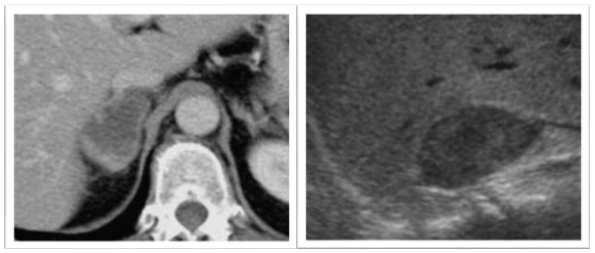
NEUROBLASTOMA METASTASIS



(A) (B)

Fig.5: A) Bone metastasis from adrenal neuroblastoma. CECT image of brain of 2 year old female patient shows expansile sclerotic lesion involving right zygomatic bone with adjacent soft tissue component. B) CECT image of pelvis shows heterogeneously enhancing soft tissue lesion along right iliac vessels with internal area of calcification.

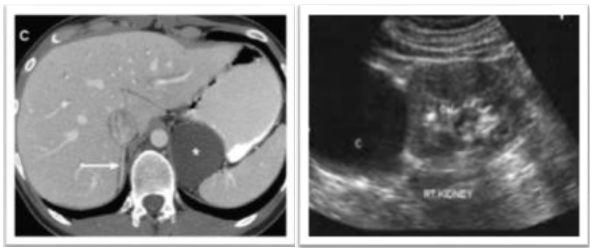
ADRENAL METASTASIS:



(A) (B)

Fig.6: A) CECT of abdomen shows 60 years male patient was presented with heterogeneously enhancing soft tissue density lesion in right adrenal region. B) Similar patient on USG shows well defined Hypoechoic lesion in right adrenal region. Patient is known cases of carcinoma of lung. On HPE: Metastatic adenocarcinoma.

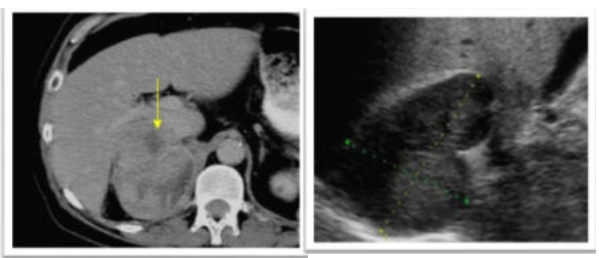
ADRENAL CYST:



(A) (B)

Fig.7: A) CECT abdomen of 30 years female patient shows well defined fluid density lesion in left adrenal region. B) USG image of another patient of 25 years male shows well defined anechoic lesion in right adrenal region.

ADRENOCORTICAL CARCINOMA:



(A) (B)

Fig.8: A) CECT of abdomen shows 42 years female patient was presented with heterogeneously enhancing soft tissue density in right adrenal region. B) Similar patient on USG shows well defined Hypoechoic lesion in right adrenal region. On HPE: Right adrenocortical carcinoma.

SUMMARY AND CONCLUSION

- 50 cases were studied to evaluate age, sex, incidence and nature of adrenal lesion.
- Maximum cases were in age group of 26-45 years accounting for 34% (17 out of 50 cases) followed by 30% of cases in age group 0-5 years (15 out of 50 patients)
- Males were more affected than female, 58% and 42% respectively.
- Neuroblastoma was the most common in malignant adrenal lesions in present study accounting for 32% (16 out of 50 cases, followed by adrenal metastasis 24% (12 out of 50 cases) and adrenal cortical carcinoma 10 %(5 out of 50 cases),
- Plain films of abdomen showed soft tissue mass, their site, presence or absence of calcification bowel loop displacement.
- USG useful in detection of anatomic location, size, extent, nature: cystic, solid or complex, internal calcification etc. it is cheaper, easily available and without radiation hazards.
- CT was also helpful in carrying out biopsy of adrenal masses for HPE confirmation in few cases but CT has got some disadvantages as it is costly, involves radiation hazards, require sedation or even anesthesia.

REFERENCES

1. Young J.L. : Jr. miller R.W. : incidence of malignant tumours in US children. Journal of Peadiatrics :(1975), 86: 254-258.
2. M.J.Siegel M.D., Sturat J. Segel M.D: CT as a supplement to urology in evaluation of suspected neuroblastoma. Radiology (1982) 142: 435-438.
3. Lam KY, Lo CY: Metastatic tumours of the adrenal glands: a 30-year experience in a teaching hospital: Clin Endocrinol (Oxf). 2002 Jan; 56(1):95-101.
4. E.K.Fishman, B.M.deutch : primary adrenocortical CA, CT evaluation with clinical correlation in 26 patient. AJR : (1987) 148:915-919.
5. Al mulhim I. neuroblastoma in children: 10 years of experience in Saudi Arabia. J trop pediatric 1998. April 44 (2). 77-80
6. De. Lagausie P, Berrebi D, Michon J. laparoscopic adrenal surgery for neuroblastoma in children. J urol. 2003 sep;170 (3)932-5
7. Norman J lacayo. Paediatric neuroblastoma. Medscape. Jun 6 2012.
8. A. Bousvaros. D. R. kirks. H. Grossman. Imaging of neuroblastoma: an overview: Pediatric radiology. Feb 1986, volume 16 Issue 2, pp 89-106.
9. Genc H, Haciyanli M, Haciyanli SG, Dag F, An adult neuroblastoma: a case report. Acta chir Belg. 2005 Nov-Dec;105(6):673-6
10. Araki The, Itai Y, Iio M. CT features of calcification in abdominal neuroblastoma. J Comput Assist TOmogr. 1982 Aug;6(4):789-91.
11. Alan P.B, robin P. Boushey. Adrenal cortical carcinoma. Current treatment options in oncology. 2001, volume 2, Issue 4, pp- 355-364.
12. George T Griffing, MD; Chief Editor: George T Griffing, MD. Adrenal Incidentaloma Clinical Presentation. Medscape. March 22 2013.
13. Franco Mantero, Nora Albiger. A Comprehensive Approach to Adrenal Incidentalomas. (Arq Bras Endocrinol Metab 2004;48/5:583-591).
14. Kim SH, Brennan MF, Russo P, Burt ME, Coit DG: The role of surgery in the treatment of clinically isolated adrenal metastasis: Cancer. 1998 Jan 15; 82(2):389-94.
15. Prinz R A, Barresi R V Laparoscopic Adrenalectomy. Arch Surg. 1999;134(2):212-217. doi:10.1001/archsurg.134.2.212.