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Evaluation of Retroperitoneal Tumors by Computed Tomography.

KEYWORDS: Computed tomography, retroperitoneum

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ABSTRACT *50 cases irrespective of age and sex of the retroperitoneal tumors were evaluated by computed tomography. Histopathological correlation was done by biopsies taken from the lesion. The commonest lesions found were renal tumors and retroperitoneal lymphadenopathy. Whenever the other Conventional procedures cannot establish the definitive diagnosis, CT usually provides conclusive evidence. Hence it may be used either as a primary diagnostic imaging technique or in the further evaluation of tumours detected or suspected by another diagnostic test.*

AIMS AND OBJECTIVES

To study the spectrum of the malignant retroperitoneal lesions by computed tomography and to correlate the computed tomography findings with histological examination.

MATERIALS AND METHODS

Materials:

In present study, the clinically suspected cases of retroperitoneal tumours were evaluated on computed tomography. 50 patients irrespective of age & sex were evaluated.

Methods:

In all patients, the following method of study was used.

- Detail history of the patients was obtained. Any past history of hypersensitivity to the contrast material was elicited.
- Through clinical examination of the patients was carried out
- Review of previous radiological and/or pathological investigations; if available, was done.
- CT scan was performed in with acquisition from lower chest up to the pelvis.
- CT guided biopsies were taken to obtain the tissue from the lesion for histopathological diagnosis whenever possible.

REVIEW OF LITERATURE

Malignant retroperitoneal tumours can be classified as:

1. Tumours arising as primary unattached masses, perhaps originating from the embryonic urogenital tissues;
2. Tumours developing in organs normally present in the retroperitoneal space;
3. Primary or metastatic tumours involving retroperitoneal lymph nodes as a manifestation of a systemic process;
4. Tumours arising intraperitoneally but invading the extraperitoneal space by extension.

PRIMARY RETROPERITONEAL TUMOURS:

The diagnosis of tumours arising from retroperitoneal tissue readily accomplished with CT even when they are relative small. Such neoplasms, usually sacromas, appear on CT generally as soft tissues density masses that displace, compress or obscure the normal retroperitoneal structures. Adjacent organs may be seen invaded by the tumour mass.

Differential diagnosis among the various histological types of sarcoma e.g. liposarcoma, malignant fibrohistiocytoma, fibrosarcoma, lymphosarcoma, leiomyosarcoma, hemangiopericytoma, mesenchymal sarcoma, teratosarcoma and neurosarcoma still depends on microscopic study as by needle biopsy.

Although most solid retroperitoneal tumours have attenuation values similar to muscle tissue a specific histological diagnosis occasionally can be suggested based on unique CT findings.

Lipomas appear as sharply marginated homogenous masses with CT densities equal to normal fat.

Liposarcoma can be distinguished from beninglipoma as they are inhomogenous, poorly marginated or infiltrating and have CT numbers greater than the patient's normal fat. They also exhibit contrast enhancement.

Leiomyosarcoma shows characteristic features of tissue necrosis and cystic degeneration with areas of tumor approaching attenuation value of water.

Primary Extragonadal Germ Cell Tumours of the Retroperitoneum:

Primary Extragonadal Germ Cell tumours (EGCTs) are rarely encountered neoplasms (1 % - 2.5 % of all germ cell tumours) that occur without an apparent gonadal primary neoplasm. The majority of germ cell tumours in the male present as metastasis from a testicular primary lesion.

Leiomyosacromas:

Leiomyosacroma is an uncommon malignant neoplasm of smooth muscle origin that tends to arise in the alimentary tract, retroperitoneum, genitourinary tract or soft tissues. Leiomyosacromas comprise 11 % of all retroperitoneal malignancies.

Liposarcomas:

Liposarcomas represent the most common primary retroperitoneal malignancy. Four histologic type of liposarcomas have been described, well differentiated (with abundant mature fat cells), pleomorphic, round cell, and myxoid (there is relatively little fat in the latter group).

Volume : 5 | Issue : 2 | Feb 2015 | ISSN - 2249-555X

Rhabdomyosarcoma:
Rhabdomyosarcoma is the most common soft tissue sarcoma of children under 15 years of age and is one of the most common soft tissue sarcoma of adolescents and young adults. It is definitely rare in persons older than 45 years

Angiosarcomas:
Angiosarcomas are malignant vascular tumours. They are one of the rarest forms of sofi tissue sarcomas. They may occur in any location in the body, and they rarely arise from major vessels.

Primitive neuroectodermal tumour (PNET):
PNET or peripheral neuroepithelioma is a primitive neuroblastic tumour arising outside the autonomic nervous system. It is the second most common type of sarcoma in the first two decades of life, but may present as an organ based neoplasm. It is typically seen in soft tissues of chest wall and paraspinal neoplasm.

Malignant fibrous histiocytomas:
Malignant fibrous histiocytomas probably represent the most common soft tissue sarcomas of late adult life with approximately 15% being found within the abdominal cavity or retroperitoneum.

RETROPERITONEAL LYMPHADENOPATHY:
Normal unopacified lymph nodes are routinely seen on CT scans as small soft tissue densities ranging from 3 to 10 mm in size. The diagnosis of retroperitoneal lymphadenopathy by CT is based on recognition of nodal enlargement. In abdomen and pelvis lymphnodes are considered unequivocally abnormal if they exceed 2 cm in cross- section diameter. Lymphnodes in the retrocrural space are probably pathologic if they exceed 6 mm in size.

NEOPLASM OF PANCREAS:
Carcinoma of Pancreas:
The recognition of carcinoma on CT scans depends upon the identification of an alteration in the size, shape, configuration, margins or density of the pancreas.

Islet Cell Tumours:
Most islet cell tumours are malignant in nature and present as relatively large masses that tend to be well-circumscribed .On CT alone these tumours are difficult to distinguish from other pancreatic neoplasm.

Cystadenoma and Cvstadenocarcinoma:
They are rare pancreatic tumours and appear as low density, multiloculated lesions, sometimes with calcification in the wall.

RENAL TUMOURS:
CT is the primary modality for detection, diagnosis & staging of RCC. Tumour calcification occurs in as many as 31% of cases & may take the form of amorphous internal calcification or curvilinear calcification, which may be peripheral or central

WILM'S TUMOR:
On CT, a Wilm's tumour usually appears as a large, spherical, internal mass, very often with a well-defined rim of compressed renal parenchyma or pseudo capsule surrounding it.

Angiomyolipoma:
AMLs are benign hamartomas composed of blood vessels, smooth muscle, and fatty tissue. AML is seen in two distinct clinical forms, sporadic (isolated) and in association with tuberous sclerosis. Although exact figures are difficult to obtain, the sporadic form accounts for approximately 80% to 90% of cases of AML.

ADRENAL TUMOURS:
Accurate diagnosis of adrenal tumours is best possible on CT examination, which may be not so in cases of other diagnostic modalities including ultrasound examination.

The accuracy of CT in detection intraadrenal pheochromocytomas is nearly 100 % .

Adenomas:
Much attention has been focused on the use of delayed contrast enhanced CT to differentiate benign adrenal adenomas from non- adenomas. Reports were based on the demonstration that adrenal adenomas had significantly lower attenuation than that of non-adenomas on delayed contrast enhanced CT scan at arbitrarily chosen times(between 3 and 50 minutes) after contrast infusion.

Adrenal Metastasis:
The CT findings of metastastic disease to the adrenal gland demonstrate that metastases tend to be larger and less well defined, with inhomogeneous central areas that have thick, irregularly enhancing rims. The metastases are frequently bilateral.

NEUROBLASTOMA:
Neuroblastoma is the most common primary extracranial solid tumour in childhood. It can occur anywhere along the sympathetic chain from the neck to the pelvis: 75% are in the abdomen, and two thirds of these (50% of the total) are in the adrenal gland. Twenty percent of neuroblastomas occur in the chest and neck. Most children with Neuroblastoma are between 1 and 5 years of age.

DUODENAL CARCINOMA:
Primary Adenocarcinoma:
Most of primary duodenal carcinomas usually occur in the periampullary region and in the third part of the duodenum; the duodenal bulb involvement is extremely rare.

Lymphoma:
Duodenal lymphoma is rare because the distribution of lymphoma is proportionate to the amount of lymphoid tissue

Metastatic Neoplasms:
Direct invasion from tumours of the adjacent organ is the most important route for spread of neoplasm to the duodenum. The primary tumour sites include the pancreas, stomach, gallbladder, liver, biliary tract, right colon and right kidney. In metastatic pancreatic or bile duct tumour, the medical aspect of the C-loop is involved with eccentric duodenal wall thickening.

COLORECTAL CARCINOMA:
Asymmetrical wall thickening with or without an irregular surface suggests a neoplastic process.Tumours of the hepatic flexure and proximal transverse colon initially spread to the paracolic nodal group and the nodes of the gastrocolic trunk, whereas distal transverse colon and spelling flexure tumours spread to nodes in the mesocolon along middle colic vessels. Low rectal or anal tumours drain into the inguinal nodes.

Volume : 5 | Issue : 2 | Feb 2015 | ISSN - 2249-555X

LYMPHOMA:

Hodgkin Lymphoma:

Histologically, Hodgkin lymphoma is classified into several forms. The nodular sclerosing type is most frequent (50% to 80% of cases) and of intermediate aggressiveness.

Non Hodgkin Lymphoma:

The staging of lymphomas according to the Ann Arbor system is as follows:

Stage I disease: involvement of one lymphnode group.

Stage II disease: involvement of more than one lymph node group on the same side of the diaphragm.

Stage III disease: involvement of lymphnode on both sides of the diaphragm.

Stage IV disease: spread outside the lymphatic system.

Patients with symptoms such as weight loss, nocturnal sweating, and/or fever are considered to have "B" disease; those without these symptoms are considered to have "A" disease.

CT Presentation:

CT is strongly advocated for measuring the extent of the lymphoma prior to initiation of treatment. It can be of great

assistance in planning ports for radiation therapy. Mesenteric disease which is seen in more than half of the patients (versus fewer than 5% of those with Hodgkin disease), is also easily visualized.

Neoplasms of the biliary tree:

Bile duct carcinoma or CCA is a rare malignancy comprising 0.5% to 1.0% of all malignancies (Nesbit GM). CCA can arise elsewhere in the remainder of the EHBDS. Typically, these tumours are of the infiltrating type, with little detectable mass. CCA should be suspected if there is an abrupt end to the biliary dilatation without a visible mass, especially if it occurs between the hilum and pancreatic head.

OBSERVATIONS

TABLE 1.: Sex-wise distribution of cases, shows Male: Female ratio is 1: 0.78

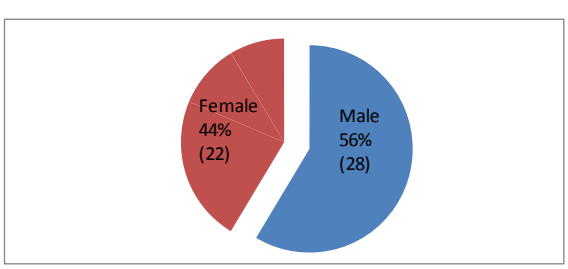


TABLE 2. Age wise distribution of Cases

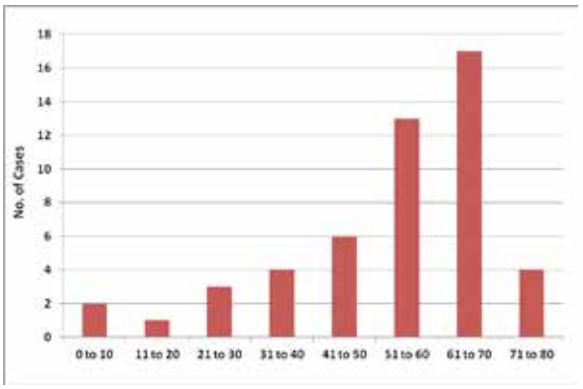


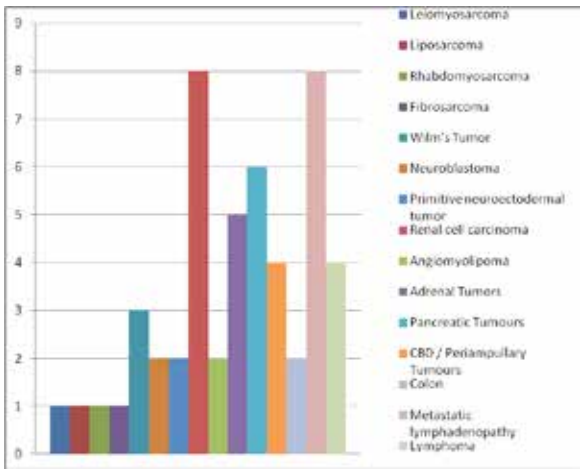
TABLE 3. CT characteristic of the retroperitoneal tumors

Type	Soft tissue attenuation	Fat component	Cystic component	Calcification	Post-contrast enhancement
Metastasis	Iso to hyperdense	+/-	+/-	+	Heterogenous
Lymphoma	isodense	-	-	-	Homogenous
Liposarcoma	Hypodense	+	+/-	-	Minimal
Fibrosarcoma	Iso to hyperdense	-	-	+	Heterogenous
Rhabdomyosarcoma	isodense	-	+/-	+/-	Moderate
PNET	Heterogenous	-	+	-	Moderate patchy
RCC	Heterogenous	+/-	+	+	Moderate
AML	Hypodense	+	+	-	Mild
Wilms tumor	Iso to hypodense	+/-	+	+	Heterogenous
Pancreatic tumor	Isodense	+	+	+	Heterogenous
CBD	Isodense	-	+/-	+	Heterogenous
Adrenal tumor	Heterogenous	-	+	+	Moderate
Neuroblastoma	Heterogenous	-	+	++	Mild to moderate

TABLE 4. Types of Tumors

TYPE OF TUMOR	NO. OF CASES
Leiomyosarcoma	1
Liposarcoma	1
Rhabdomyosarcoma	1
Fibrosarcoma	1
Wilm's Tumor	3
Neuroblastoma	2
Primitive neuroectodermal tumor	2
Renal cell carcinoma	8
Angiomyolipoma	2
Adrenal Tumors	5
Pancreatic Tumours	6
CBD / Periampullary Tumours	4
Colon	2
Metastatic lymphadenopathy	8
Lymphoma	4
Total	50

Volume : 5 | Issue : 2 | Feb 2015 | ISSN - 2249-555X



DISCUSSION

In case of retroperitoneal mass, an early diagnosis and treatment ensures favourable prognosis. In present series 56 % were male and 44 % were females, which show slight male preponderance.

In a series carried out by David Stephens1 Patrick F. Sheddy 1, 12 out of 19 patients were male showing male preponderance, which correlates well with our study.

There is no sex predilection as reported into two large series (Pack and Tabbah 1954)2 and (Brach and Mom 1967)

In our study ages range from 1 year to 78 years with more than half patients over 50 years. The maximum age incidence was in 5th & 6th decade. None of the age group is exempted.

Secondly the age incidence in first decade was 12 % in this series. Newman & Pinck, which correlates with our study, emphasized high incidence in children.

The majority of symptoms and signs are produced by mass compressing or displacing an organ or presenting as a lump.

Vague abdominal pain or abdominal discomfort, presence of mass, anorexia and weight loss was the most common presenting features in this series.

Their relative frequency reported by different authors is compared with present Study. Vague pain in abdomen, general debilitation, and weight loss were commonly seen.

However these Symptoms are non-specific and are of little help in arriving at a diagnosis of retroperitoneal tumour and because of this non-specificity of symptoms CT often diagnoses retroperitoneal tumours.

As it is usual with retroperitoneal tumours, most of the tumours were quite large. Out of 50 cases most of the tumours presented were more than 10 cm in size.

In a study carried out by Patrick F. Sheedy[3] out of 19 tumours 13 tumours were larger than 10 cm in largest diameter which correlates well with our study.

At the extreme were enormous tumours, some occupying the greater part of abdomen and even protruding beyond

In our study some patients had undergone follow-up scan. Because CT accurately displayed the dimension of tumour, follow up examinations were useful to detect changes in size of tumour.

Composition:
A number of CT features and clinical findings suggest specific diagnosis when present.

1. Presence of calcification in the renal cell carcinoma.
2. Presence of fat in liposarcoma.
3. Large necrosis in leiomyosarcoma.
4. Calcified lesion in children in neuroblastoma.

Metastatic lymphadenopathy & Lymphomas:
In the present series metastases to retroperitoneal lymph nodes were seen in 8 cases which constituted 16% commonest cause was genitourinary malignancy

Accurate preoperative determination of tumour extent helps in design of radiation port for seminomatous group and in the choice of initial mode of treatment in non-seminomatous group, and hence the role of CT is very important in metastasis of RP tumours.

CT is also used as part of an abdominal oncologic survey in the patients with known malignancy such as melanoma and colon carcinoma, Lymphoma, one of the common retroperitoneal tumours, accounted to 8 % in present series. Lymphoma form one of the largest single group,

occurring in reported series of retroperitoneal tumours the incidence of retroperitoneal lymphoma was 20% in the series reported by Pack & Tabbah.

In our study we found enlarged group of pancreatic as well as other mesenteric lymph nodes as well as the involvement of spleen was also seen which obviated the need of staging laparotomy. CT noninvasively accurately displayed the size of lymph node masses and its relation with the other organs.

In present series we had one case of liposarcoma, fibromyosarcoma, rhabdomyosarcoma and two cases of PNET.

In liposarcoma, the mass was sharply marginated and was having a pseudocapsule. The CT numbers were greater than that of the patient's normal fat. It correlated well with the study carried out by Friedman.

The one case that we ecountered of rhabdomyosarcoma was seen in young female. It correlated well with the study carried out by in which rhabdomyosarcoma was the most common soft tissue sarcoma of adolescent and young adult.

In our series we had two cases of PNET one of which was organ based. On CT examination the mass presented as a large hypodense mass with peripheral enhancement.

Volume : 5 | Issue : 2 | Feb 2015 | ISSN - 2249-555X

Renal tumours: (Fig.1)

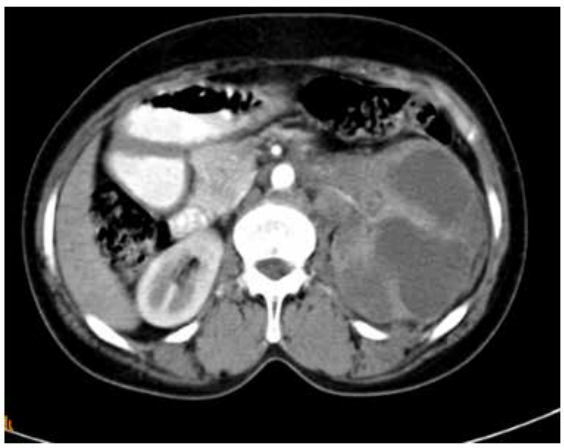


Fig. 1. Axial CECT shows enlarged left kidney with heterogeneous mass and few hypodense areas within it.

The CT scan of 12 patients with renal neoplasms showed fairly good accuracy.

CT diagnosis & final diagnosis of renal masses are tabulated as follows:

CT DIAGNOSIS	PATIENTS	HISTOPATHOLOGICAL DIAGNOSIS
RCC	Seven	Seven
AML	Two	Two
Wilm's tumor	Three	Three
RCC	One	Retroperitoneal sarcoma

Most of the cage of RCC showed heterogenous enhancement with few nonenhancing areas suggesting necrosis. Some of the cases showed areas of calcification.

Angiomyolipoma (AML):
In a study carried out by John L Sherman, David S. Hartman4 out of 17 cases of angiomyolipoma majority was females, comprising to total of 15 cases.

We had 3 cases of angiomyolipoma of which 2 were females. The size of their study varied from 1.5 to 20 cm.

In a study carried out by Bosniak et al5 out of 6 patients in 3 patient's fat was detected definitely on thin sections of 5 mm.

In our study; in 1 patient, fat was detected on 5 mm (-10 HU) & was definitely present on 2 mm section. So our study correlated well with all these studies.

Wilm's tumor:
We had 3 cases of Wilm's tumour of which one was bilateral. In a study carried out by Threasa et al6 bilateral Wilm's tumour was found. Necrosis & pseudo capsule were well identified. In one of the case tumor CT scan identified thrombosis.

Pancreatic & distal CBD tumours: (Fig.2)

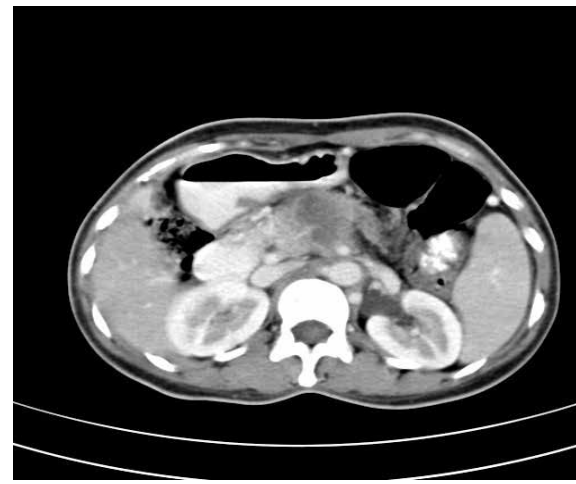


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Fig. 2. Axial CECT abdomen reveals hetergenous enhancing mass lesion involving the pancreas neck and proximal body.
We had 6 cases of pancreatic tumours. In a study done by Patrick C. Freeny MD[7], the most common CT findings were a mass, seen in 96% of the patients. In these cases lack of a central zone of diminished attenuation, pancreatic or bile duct dilatation, local extension or distant spread suggested correct diagnosis.

Most of the cases of pancreatic tumour in our study presented as a mass in the region of head causing dilataion of pancreatic duct were present in the region of tail.

Colonic cancer:
In our series we had one case of colonic cancer in which the mass appeared as discrete mass with wall thickening of more than one com with irregular surface suggesting a neoplasm. Similar findings were seen in the study carried out by (KO Gy)[8] thus our study correlated well with that study.

Adrenal tumours: (Figure 3.)

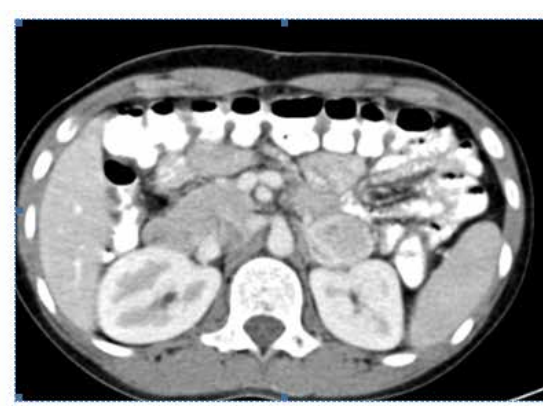

Fig. 3.: Axial CECT abdomen reveals abnormally enhancing mass lesion involving the left adrenal gland.
Out of 5 cases of adrenal tumours two were of metastases which were bilateral. Others were that of aqdenomas and pheochromocytomas. Most of the tumours were poorly enhancing as many adrenal tumours have a low absorption coefficient even after administration of intravenous contrast material as mentioned by Dunnick et al.[9]

Volume : 5 | Issue : 2 | Feb 2015 | ISSN - 2249-555X

Neuroblastoma:

We had two cases of neuroblastoma; both of the patients with age of 3 and 4 years. Thus our study correlated well with study of (McNeill P.M.)[10] in whom the age incidence was between one and five years. In study carried out by (Lane R.H.) there was evidence of chunky and speckled calcification in 80% of cases of patients and mass was seen to cross midline and encase great vessels. Thus out study correlated well with that study.

CONCLUSION:

- CT is simple, safe procedure and can be done on OPD basis.
- Whenever the other Conventional procedures cannot establish the definitive diagnosis, CT usually provides conclusive evidence. Hence it may be used either as a primary diagnostic imaging technique or in the further evaluation of tumours detected or suspected by another diagnostic test.
  - CT scan can be obviating the necessity of other diagnostic tests and at times, diagnostic or a staging laparotomy.
- Most efficacious use of the CT scan is early in evaluation of ischemic colitis may develop number of patients with high index of suspicion. Early primary diagnosis as well as the stage of the disease can often be accurately determined.
- By conclusively establishing the diagnosis a definitive line of treatment can be chosen.
- It can be repeated easily and hence can document response to treatment. It has thus significant value in follow up and for evaluation of recurrence.

Thus CT seems to be fulfilling its role as low risk, low morbidity, painless, noninvasive, simple and most accurate method of evaluating retroperitoneal masses in present clinical practice.

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