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Research Article

Metastases in Transitional Cell Carcinoma: A Pictorial Essay from Tertiary Care Cancer Hospital

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Abstract: Transitional cell carcinoma (TCC) also known as urothelial carcinoma is the one of the most common primary tumor of the urinary tract. Entire length of the urinary tract can be involved, however the bladder involvement is by far the most common and is usually diagnosed at cystoscopy. Only 10% of the TCC is found in the upper tract. [1] Smoking and exposure to various industrial chemicals are known risk factors. Usually men are more affected with mean age of 60 years. Metastasis in the TCC is not unknown and may involve several regions including lymph nodes, liver, lungs, bones and adrenal glands. Rarely metastases into the brain, skin or spleen can also be encountered. Owing to poor prognosis in the metastatic TCC, it is of high concern to have a thorough knowledge regarding the spectrum and features of metastases in the patients of transitional cell carcinoma. In this pictorial essay, we have set forth various presentations of metastases and their imaging appearances presented in our Tertiary Care oncological setup.

Keywords: Transitional cell carcinoma. Metastases. Urinary tract.

INTRODUCTION:

Transitional cell carcinoma (TCC) is a frequently seen malignancy of the genitourinary tract predominately involves the urinary bladder for upto 90% of the cases (Kirkali, Z., & Tuzel, E. 2003). Most of the patients with transitional carcinoma present with hematuria and flank pain; however, about 30% of the patients also complain of acute renal colic in background of urinary calculi (Browne, R. F. *et al.*, 2005). It is further presented with multi-focality as well as higher chances for recurrence. Metastases in the transitional cell carcinoma is not unknown, thus Radiologist should have a thorough knowledge of various presentation as well as imaging features of the metastases in cases of transitional cell carcinoma. Most of the times the metastases in the transitional cell carcinoma are found on the autopsy sampling (Browne, R. F. *et al.*, 2005; & Babaian, R. J. *et al.*, 1980). Nodal involvement is also noted in these patients reaching up to 60% of the cases of T3 or greater stages (Vikram, R. *et al.*, 2009). Accurate and early detection of the metastases into the various organs as well as into the adjacent lymph nodes is vital for better patient managements and outcome. Radiologically the MRI pelvis scan without contrast is acquired for local staging, however CT scan as well as PET scan has a role in detection of metastases. In this pictorial essay we will have a glance over various presentations and imaging features of metastases in transitional cell carcinoma patients.

INTRACRANIAL METASTASES:

Intracranial metastases are a rare phenomenon occurring even less than 1% in the patients of transitional cell carcinoma (Vazina, A. *et al.*, 2004). Cerebral metastases are more common in the patients which are treated locally via chemotherapeutic agent without any systemic therapy (Mahmoud-Ahmed, A. S. *et al.*, 2002). On MRI sequences the intracranial metastatic deposit usually shows T1 iso to hypo intense signal changes with associated hyper intense signals on T2 weighted images. Occasionally internal hemorrhage is also identified which show hyper intense signal changes on T1 sequence depending on the age of the hemorrhage. There is also noted surrounding mass effect and vasogenic edema (Anderson, R. S. *et al.*, 1992).

A 51-years old male presented with hematuria and dysuria for one year has muscle invasive transitional carcinoma and was on treatment. Had seizures and left sided body weakness.

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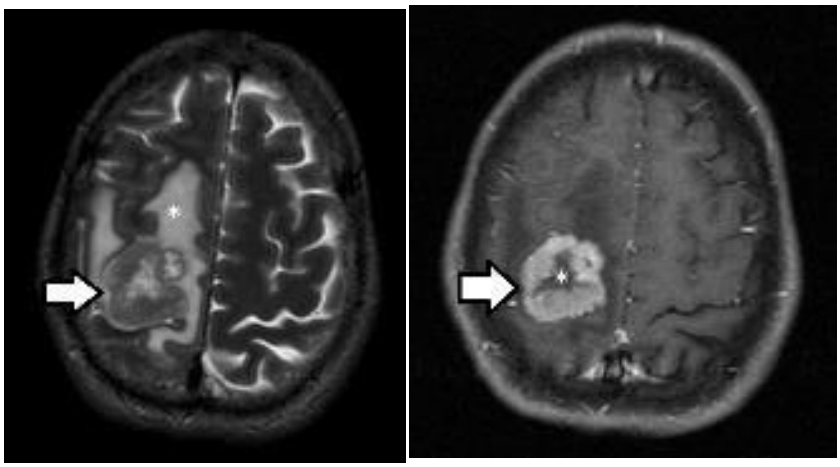

Figure 1a **Figure 1b**

Figure 1 a (T2 axial MRI brain pre-contrast) showing a heterogeneous intra-axial mass with internal necrosis seen in the right parietal lobe. (Arrow) Significant surrounding vasogenic edema also noted (asterisk).

Figure 1 b (T1 post contrast axial MRI brain) showing marked enhancement in the intra-axial lesion (arrow). There is central necrosis (asterisk). Mild mass effect is noted, however ipsilateral ventricle is not compromised (not shown). The lesion radiological characteristics are highly suggestive of an intracranial intra-axial metastatic deposit in background of TCC.

Another case of a 63-years old male known chronic smoker presented with dysuria for five months in the form of burning micturition and difficulty in passing the urine. Cystoscopy + TURBT showed high grade muscle invasive TCC. Patient remained on treatment; however represented with history of vomiting since two days.

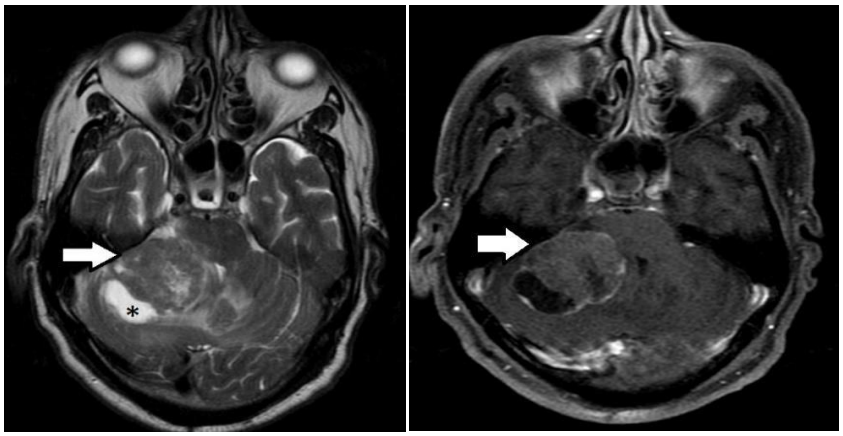

Figure 2a **Figure 2b**

Figure 2a (T2 sequence MRI brain axial slice) shows a large right cerebellopontine angle mass showing heterogeneous signal intensity changes. (arrow) The lesion appears extra axial in origin with subsequent mass effect on the cerebellum and the middle cerebellar peduncle as well as brainstem. Note the adjacent cystic change (asterisk) There is no extension into the internal auditory canal.

Figure 2 b (MRI T1 post contrast axial image) showing the lesion demonstrating mild to moderate contrast enhancement with cystic changes (arrow). The spectroscopy was also done which was suggestive of metastases in this patient (not shown).

Adrenal Metastases:

Adrenal metastases comprise of up to 21% of the metastases in the patients of transitional cell carcinoma (Babaian, R. J. *et al.*, 1980). More often the adrenal metastatic lesions are seen in the autopsy studies (Moon, K. S. *et al.*, 2011). Despites the presence of adrenal metastases the patient gets rarely symptomatic with adrenal insufficiency. Presence of adrenal nodule in background of a TCC remains of high concern for metastatic deposit.

A 64-years old male presented with muscle invasive transitional cell carcinoma of the urinary bladder and history of difficulty in micturition for five months.

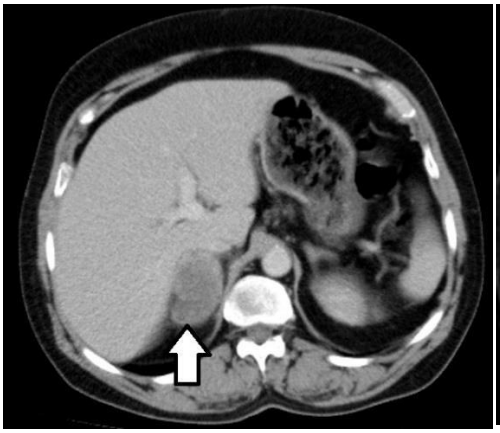

Figure 3a

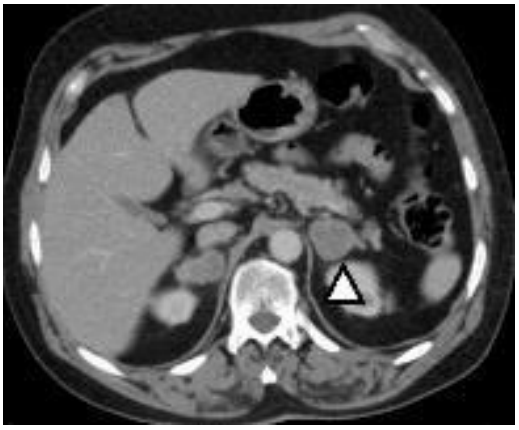

Figure 3b

Figure 3a (contrast enhance CT axial slice) showing a large relatively hypo enhancing mass seen in the right adrenal gland (arrow)showing surrounding mass effect and is highly concerning for a metastatic deposit. This was further subjected to an ultrasound guided biopsy and turned out to be poorly differentiated carcinoma likely metastases from the background transitional cell carcinoma in this patient.

Figure 3b (CECT axial image) follow up CT showed interval development of adrenal metastasis in the left adrenal gland (arrow head).

Pulmonary Metastases:

Pulmonary metastases in background of transitional cell carcinoma are often seen as single mass or could present as a multiple nodules. Rarely upto 0.6% of the times the urothelial carcinoma is seem to be having cavitatory metastatic deposits (Babaian, R. J. *et al.,* 1980). If cavitate they can be misinterpreted as fungal lesions. Pulmonary metastases has better patient survival rate in comparison with a metastases into the bones and the liver (Geller, N. L. *et al.,* 1991).

Here is a 64-year old male with urinary bladder transitional cell carcinoma which is high grade with invasion into the detrusor muscle. He was on treatment however, presented with pulmonary metastatic deposit on re-evaluation CT scan.

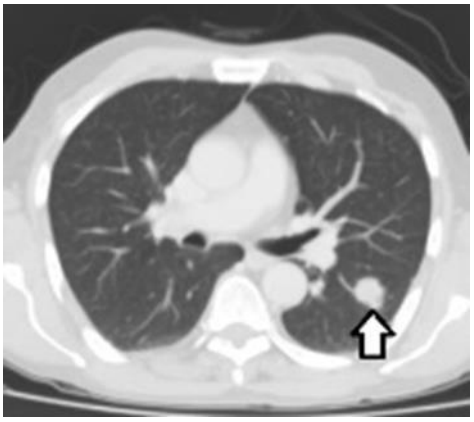

Figure 4a

Figure 4a (CECT axial slices in lung window) Shows soft tissue nodule in the apical segment of the left lower lobe measuring up to 1.8 cm (arrow). No internal cavitations or calcifications noted. This is suggestive of a metastatic deposit.

Another patient aged 54-years presented with muscle invasive transitional cell carcinoma

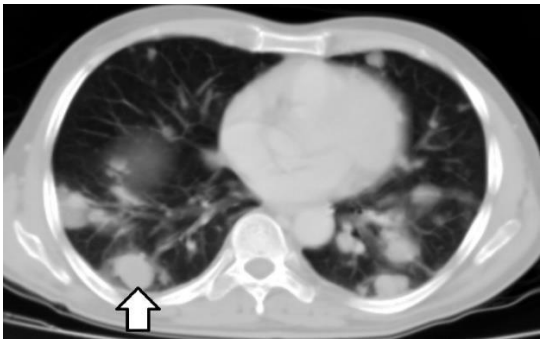

Figure 4 b

Figure 4b (CECT axial scan in lung window) There are multiple metastatic deposits in both lungs with the largest lesion in the posterior segment of right lower lobe (arrow)

Nodal metastasis:

The most common nodal involvement in presence of the transitional cell carcinoma are internal iliac, external iliac and obturator nodal territories making upto 20-40% of the metastases owing to primary lymphatic drainage; however metastases above the diaphragm is a rare phenomenon (Vazina, A. *et al.*, 2004).

Here is a case of a 63-years old female patient with bladder invasive transitional cell carcinoma on staging CT scan,

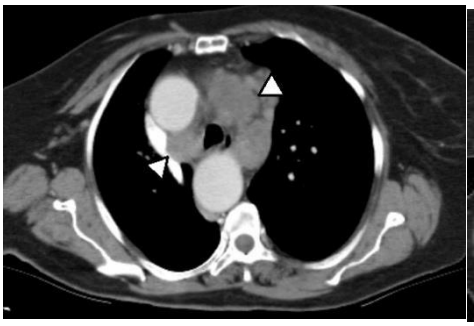

Figure 5a

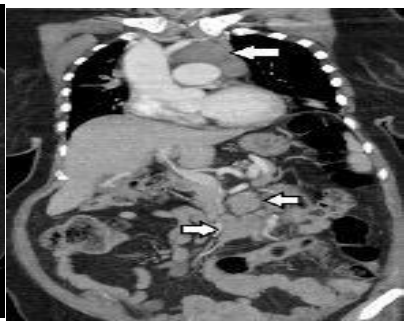

Figure 5b

Figure 5a (Axial slice through CECT) Significant mediastinal lymphadenopathy, large prevascular and para-tracheal nodes are visualized (arrow heads).

Figure 5b (coronal section CECT) showing lymphadenopathy both above and below the diaphragm (arrows). The nodal disease remained suggestive of metastatic disease involvement.

Hepatic Metastases:

Hepatic metastases are also known phenomenon in patients of transitional cell carcinoma which usually present as solitary mass or multiple discrete masses showing relatively hypo enhancement in comparison with the background hepatic parenchyma (Fassnacht, M. *et al.*, 2018).

Here is a case of a 63-years old male patient with ureteric transitional cell carcinoma, status post radical nephroureterectomy. He was on treatment.

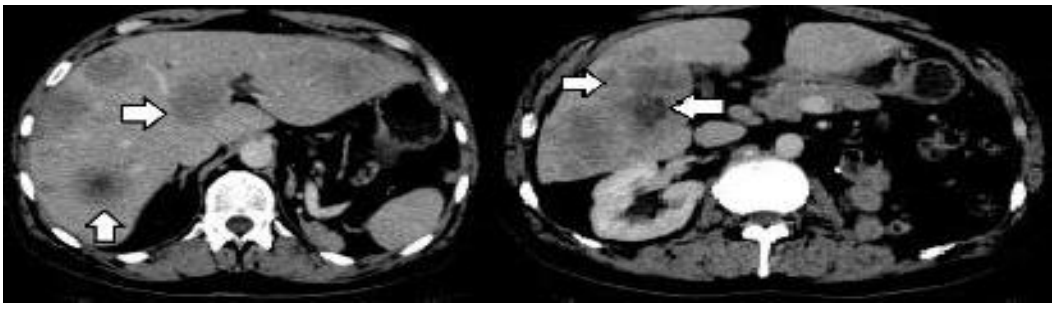

Figure 6a **Figure 6b**

Figure 6 a and figure 6 b (CECT axial slices through different levels) demonstrate multiple heterogeneous relatively hypo attenuating lesions scattered throughout the liver (arrows) highly compatible with multiple hepatic metastatic deposits in this patient. Patient had also developed multiple pulmonary nodules as well as enlarged subcarinal lymph nodes and mediastinal lymph nodes subsequently(not shown).

Osseous Metastases:

Osseous metastases in transitional cell carcinoma patient is relatively uncommon in comparison with the other malignancies like breast and CA prostate. Almost 40% of the osseous metastases in transitional cell carcinoma involves the spine (Shinagare, A. B. *et al.*, 2011). Rarely in background of unknown transitional cell carcinoma a metastatic osseous deposit can mimic as that of an osteosarcoma/primary bone tumor (Punyavoravut, V., & Nelson, S. D. 1999).

A 72-years old male presented with muscle invasive transitional cell carcinoma had pulmonary metastases.

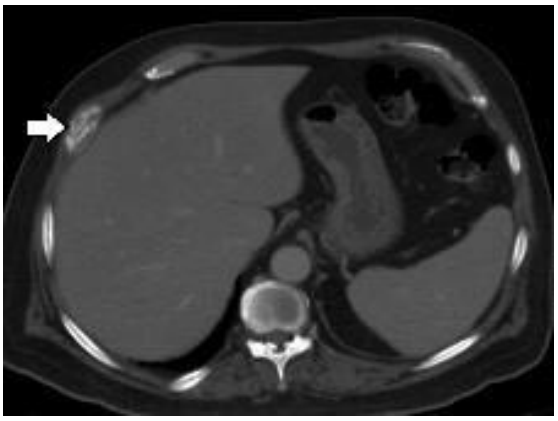

Figure 7a

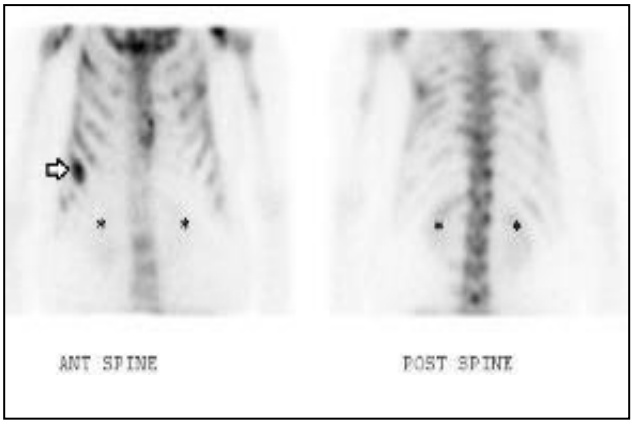

Figure 7b

Figure 7a shows mixed lytic - sclerotic osseous lesions within the imaged skeleton which was remained concerning. There is an expansible osseous deposit with sclerosis in the 7th right anterior rib (arrow).

Figure 7b showing bone scan with abnormal heterogeneous uptake of the tracer in bilateral ribs and spine. The expansile lesion seen in CT scan also shows increased tracer uptake (arrow) Kidneys were faintly visualized (asterisks)due to high skeletal uptake compatible with extensive skeletal metastasis in this patient.

Splenic Metastases:

Metastases from the transitional cell carcinoma into the spleen is itself is rare entity (Punyavoravut, V., & Nelson, S. D. 1999). Very less cases of splenic metastases are seen in the literature.

Here is a case of 54-years old male presented with muscle invasive transitional cell carcinoma on initial staging workup. There were extensive pulmonary and hepatic metastases.

Figure 8a

Figure 8a(CECT axial slice) showing a few hypo attenuating lesions seen within the spleen with largest showing internal heterogeneity measuring up to 1.8 cm in dimension (arrow) compatible with splenic metastasis. Also noted multiple hypo attenuating lesions in the liver (arrow heads) suggestive of hepatic metastasis. Patient went for right uretero-nephrectomy; however could not survive due to extensive cancer burden.

Muscular Metastases:

As per high resistance of the skeletal muscles, metastases is quite rare entity. There are a few cases published showing skeletal metastases in the patients of transitional cell carcinoma (Vittoria, A. *et al.,* 1996). Hematogenous spread to the muscles is rarely seen only in the advanced stages of the neoplasm. Approximately 6% of the patients with TCC have been reported to have a muscular metastases on autopsy (Kashyap, R. *et al.,* 2010).

Here there is a case of 70-years old male with muscle invasive transitional cell carcinoma of the urinary bladder and was on chemotherapy. He also had crampy abdominal pain.

Figure 9a

Figure 9a (CECT axial slice) as a re-staging scan showing a heterogenous solid mass involving the left rectus abdominis muscle (arrow) with expansion and mass effect highly suggestive of a metastatic deposit in the rectus abdominis.

Another patient of transitional cell carcinoma with radical cystectomy followed by right nephrouretrectomy, PET scan was acquired for re-staging showing muscle metastasis. Same patient had extensive osseous as well as hepatic metastatic disease was also established in the brain as well as there was a large solid mass in the right lung lower lobe highly compatible with pulmonary metastases.

The right para-spinous/erector spinae muscle deposit also shows adjacent subcutaneous/cutaneous deposit which is relatively a rare entity and ranges from 0.18% to 2% (Doo, S. W. *et al.,* 2012). The route of cutaneous metastases can be either direct through the lymphatic channels or hematogenous spread (Block, C. A. *et al.,* 2006).

Figure 9b

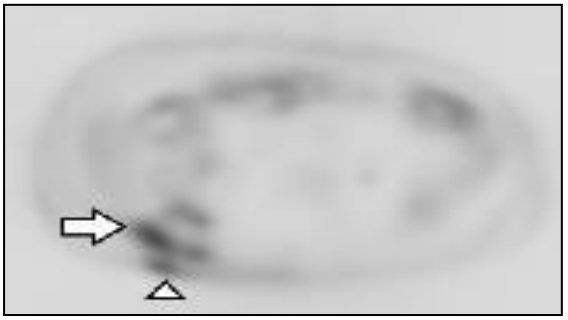

Figure 9c

Figure 9 b (FDG- PET/CT axial slices through same levels) showing heterogeneous mass seen in the right erector spinae muscle(arrow). The right para-spinous/erector spinae muscle deposit also shows adjacent subcutaneous/cutaneous deposit(arrow head).

Figure 9 c showing PET component of the CT scan at same level the right erector spinae lesion shows avidity of 12.7 SUV on PET scan(arrow). Higher metabolic activity also seen in the adjacent skin (Arrow head).

CONCLUSION:

Transitional cell carcinoma is a most common malignancy of the urinary tract with 90% of the disease involvement the urinary bladder. It is important for the Radiologist as well as clinicians to have sound knowledge regarding its presentations, late manifestation as well as metastases. Radiological presentation of different kind of metastases should be well understood to have a better diagnosis and to contribute towards patients' treatment outcome.

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