Utility of the capsular retraction in the diagnosis of hepatic pathology

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Learning objectives

- To know various causes of capsular retraction of the hepatic capsule.
- To appropriately value and make a differential diagnosis as precise as possible.

We make a bibliographical review of the different causes of hepatic capsular retraction and show some examples that we have found in our clinical practice.

Background

1. TUMOUR ENTITIES:

Hepatic Metastases

They are the most common cause of capsular retraction since they are the most common cause of malignant hepatic tumour affection. In spite of it, there are very little metastases which accompany themselves of this find. There are tumours metastases as lung, colon, breast or charcinoid tumour those who have collaborated to this sign, probably for its high content and/or aptitude to produce fibrosis. Some authors, nevertheless, have postulated that the capsular retraction produces of secondary form to the necrosis and to the phenomena desmoplastic that take place inside the tumour. It has been observed also that the phenomena of invasion or of vascular thrombosis can cause infarct areas that might accompany themselves of capsular retraction in its most peripheral area. The appearance of these injuries is much changed in the different image tests. The tumours metastases usually present in CT as multiple lesions of rounded morphology, hypoattenuated with regard to the adjacent parenchyma and hypovascular in most of the cases, except carcinoides, feocromocitoma, thyroid carcinoma, carcinoma of renal cells or of cells of pancreatic islets, which are visualized usually like injuries hypervascularities. For his part in the RM they are usually hypointense in sequences considered in T1 and hyperintense in considered in T2.

Fig. 2 Fig. 3

Hepatocellular carcinoma and fibrolamellar carcinoma
The HCC is the most frequent primary malignant neoplasia of the liver. Its incidence changes according to the studied area. In Occident it usually has relation with the presence of secondary hepatic cirrhosis to the excessive alcohol consumption, haemocromatosis, and exhibition to toxins or hepatitis. As analytical interest fact emphasizes the elevation of the alpha - fetoprotein.

It is a tumour that histologically can have different growth patterns, being the most frequent three: the boss trabecular, the acinar, and the glandular. Microscopically, nevertheless, different growth bosses have been described also as they are: the diffuse one, the multifocal one and the only injury.

The behaviour of the hepatocarcinoma is variable, depending especially on the grade of differentiation of the same one, but there is frequent invasion of the hepatic veins, of the vein low wine-cellar and of the vein it carries, not this way of the biliary route. It usually accompanies injuries satellites in approximately 20 % of the cases.

According to the last biggest consensus of the American Society of Hematology, the presence of a 1 cm nodule with intensification in phase arterial and wash-in phase portal in a cirrhotic liver detected with CT multidetector or MR, is a hepatocarcinoma diagnosis. In spite of this, it can turn out to be difficult to differ from other injuries as the metastasis, owed principally to the enormous changeability in its form of presentation.

There are injuries that usually have capsule, which often appears like a ring of low sign in the images considered in T1, representing its fibrous content. In the T2 the capsule usually appears like a double sheet, with the internal component of low sign and the day pupil of high sign. In the basal study of MR the behaviour changes according to its composition. If over what it predominates is the fibrosis, it will show a low sign in the images considered in T1; if over what they predominate there are the areas steatosis the sign will be high in the T1. The presence of boss is typical in mosaic, or the presence of nodule inside nodule in the study with contrast.

The hepatic capsular withdrawal provoked by the carcinomas hepatocellular is very infrequent, even more when the injury has not been treated. It is due to the fact that this type of tumours usually has a low fibrosis proportion in its interior. Nevertheless, it is usually habitual that after the treatment with chemotherapy or with ablation the tumour reduces its size and fibrosis, what can produce capsular withdrawal.

For his part the carcinoma fibrolamellar is a type of malignant tumour of slow growth that usually appears in young adults without base cirrhosis, and a better prognosis has in general that the hepatocarcinoma. The values of the alpha - fetoprotein in this type of tumours are usually normal.

It appears like a quite definite mass, of outlines lobes that can contain a central scar, and calcifications dystrophic in 35 %. The mass is hypoattenuated in TC, and isointense with regard to the parenchyma hepatic in the RM images considered in T1 and T2. Typically the central scar is hypointense in all the sequences, what allows the distinguishing diagnosis with the focal nodular hyperplasia. Peripheral, nodular intensification can be observed, in arterial phase.

Hemangioendotelioma
It is an infrequently vascular tumour especially common in adults and that usually affects soft parts, bone, lung and liver. When fond of the liver it is considered to be a tumour of low grade of malice. It does not seem to be associated with any factor etiologic and the values of the alpha - fetoprotein is not usually shaken. It is a tumour consisted of epithelial and dendritic cells inside a fibrous estroma and mixoide, with predisposition to the invasion of the hepatic venules and branch portals. The fibrous estroma joined at its subcapsular location are typical that explain the tendency of this type of tumours to the capsular withdrawal. Two forms of presentation differ: the nodular one and different diffuse.

The radiological tests as the CT demonstrate some special characteristics of this tumour. Between 10 and 25 % of the patients show spherical injuries hypoattenuated (that rarely contain calcium) with extension towards the capsular margin and withdrawal of the capsule. It is frequent to find an extensive tumour affectation of the parenchyma, there being visualized multiple subcapsular peripheral masses of that time that often come together and affect to both hepatic lobes. After the administration of contrast the tumour usually presents a centre hypoattenuated with a peripheral intensification, giving place to an image "in reveille". In RM the focal injuries are of low intensity in the images considered in T1 being of high intensity in considered in T2.

Fig. 4

Cholangiocarcinoma

It is the second hepatic malignant tumour in frequency, although its real incidence is low. It is a tumour that appears normally in the middle age of the life (50-60 years), being more frequent in the males. Histologically it is an adenocarcinoma that intrahepatic arises from the epithelium of the biliary conduits, being able to present calcifications and mucin. There are frequent nodules satellites, the venous invasion portal and the dilation of the peripheral biliary route. In its composition it predominates over the fibrous estroma although it can have areas of necrosis or haemorrhage. As a result of this so prominent fibrous estroma as well as of the chronic obstruction of the biliary route intrahepatic that produces the colangiocarcinoma, it is possible to produce an atrophy it would segment parenchymal with a secondary capsular withdrawal in 50 % of the cases. Generally it appears like a solitary and big, not encapsulated tumour, of irregular margins, often difficult to differ from the parenchyma I recover so much in studies of CT as of MR. In not confirmed studies it can turn out to be hypodense in CT, and in MR discreetly hypointensely in T1 and hyperintense in T2. After the administration of contrast peripheral ring finger can observe intensification in arterial phase, and a progressive intensification in the fibrosis areas.

Fig. 5
Hemangioma

It is the most frequent benign hepatic tumour, with an approximate predominance of 20%. It is a question of a tumour composed by multiple vascular channels arranged on a fibrous estroma. The association of capsular withdrawal is extraordinariamente infrequently and probably be a consequence of the phenomena of thrombosis and central fibrosis that take place in the bosom of the vascular channels, what usually happens with more frequency in the haemangioma of major size. In fact, most of the haemangioma that present capsular withdrawal accompanist has a size superior to 4 centimetres and it is classified as haemangioma giants.

In the CT the haemangioma they are seen like quite delimited tumours, of smooth or lobar margins, having of typical form an aspect iso-attenuated with regard to the rest of the parenchyma; those of major size can contain hypointense areas for fibrosis. The RM shows us a few characteristics of similar intensification, being classically a very hyperintense tumour in the sequences promoted in T2 and DP and hypointense in T1 (although in less measurement that the cysts), very hyperintense in diffusion and with values very tall ADC.

The vascular behaviour after the administration of contrast is diagnostic a nodular intensification one appears with progressive filling from the periphery and homogenization in balance phase.

Fig. 6

2. NOT TUMOUR ENTITIES

Hepatic Confluent fibrosis

It is a boss visualized normally in patients with cirrhosis of long evolution of alcoholic or viral origin and that is present usually in approximately 14% of the livers at the moment of the transplant. Although the capsular withdrawal cannot be present in the most initial phases of the confluent fibrosis, the normal thing is that it appears in all the cases during the latest evolutionary stages. Its form of more common presentation in image is that of an area of triangular morphology that it radiates from it carries hepatitis and that accompanies himself of capsular withdrawal or focal levelling of the capsule. Less frequent is the affectation in the shape of bands or the commitment of the totality of a lobe or hepatic segment. It usually implies more commonly to the previous portion of the right hepatic lobe and to the medial segment of the left hepatic lobe.

In the CT without contrast the fibrosis areas turn out to be typically hypoattenuated. Both in CT and in MR, in the most late phases after the administration of contrast they can turn heightened, due to the retention of the contrast inside the fibrous estroma, being a
distinctive characteristic with the hepatocarcinoma. Another sign that it can help to the diagnosis is the grouping of glasses and biliary conduits inside an area of hepatic collapse of the parenchyma, most of the malignant injuries that displace the glasses. It usually does not associate dilation of the biliary route, in contrast to the colangiocarcinoma.

Fig. 7

Biliary obstruction

When, well for causes of benign or malignant etiology, a biliary obstruction of chronic form takes place, the segment drained by these biliary conduits can atrophy. It can turn in pathologies like the primary colangitis esclerosante or the oriental colangiohepatitis. Of between them, there deserves special mention the colangitis sclerosing, an illness of autoimmune origin, associated even in 75 % of the cases to intestinal inflammatory illness. What happens is, there are multifocal tightening of the biliary tree that provokes a final cancellation of the same one, with the subsequent development of colestasis and biliary cirrhosis. This maintained of chronic form, gives place to an atrophy parenchymal that it affects with major frequency to the most peripheral segments of the liver, which usually associates hepatic capsular withdrawal. The relative preservation of the calibre of the biliary route in the caudate lobe along with the obstruction of the rest of the biliary route intrahepatic is described of classic form in the CT images. Also it is possible to observe thickening and nodularity of the walls of the biliary conduits and an increase of the intensification of the walls of the biliary route.

For his part the oriental colangiohepatitis is a rare illness that it studies with abdominal pain, fever and jaundice will help the parasitization of the biliary route for trematodes biliary (Chlonorchis and Opistorchis). It associates atrophy parenchymal especially of the side segment of the left hepatic lobe and of the later segment of the right hepatic lobe, what thinks that it is the cause of the capsular withdrawal.

Fig. 8

Secondary withdrawal to treatment

The capsular withdrawal can be detected in the proximity of tumours that have received chemotherapeutic treatment, radiotherapy or that have been treated with ablation by radio frequency. It seems that the reduction of the secondary tumour size to the treatment together with the changes of fibrosis and/or necrosis might be the persons in charge of the consistent withdrawal.

a) Retraction post-chemotherapy

The effects of the systemic chemotherapy treatment in the liver are varied. They include the greasy infiltration, the focal hepatitis, cirrhosis, fibrosis portal, the necrosis
or the hepatic infarction between others. The capsular withdrawal usually happens in the adjacent areas to the metastasis of subcapsular location which responded to the chemotherapy treatment, because after this one, the injuries usually suffer retrogression with the subsequent healing and nodular regeneration of the parenchyma recovered adjacent.

Fig. 9 Fig. 10

b) Retraction post-embolisation of hepatocarcinoma

The call embolisation arterial transcatheter used at present in the treatment of carcinomas hepatocellular chosen, is a skill that a massive tumour necrosis produces with subsequent atrophy of the surrounding parenchyma. It seems to be the cause of the capsular withdrawal that sometimes to be observes in patients that they have received this type of treatment.

c) Withdrawal post-radio frequency of hepatocarcinoma

This is another procedure used at present to treat certain hepatocarcinomas. It consists of the wave application of alternating of high frequency that they produce the ionization of the cellular components by means of friction and warming of the textiles over 60th. It is contra-indicated in subcapsular tumours or in the hepatic periphery for risk of diaphragmatic injuries or of nearby intestinal handles, therefore it is infrequent that collaborate to capsular withdrawal.

Fig. 11

d) Iatrogenic retraction

There are numerous causes that produce iatrogenic changes on the hepatic capsule. In spite of its high repair capacity, sometimes abscesses or bihillocks can form if the biliary ducts are damaged and we even also can observe infected haematomas or infarctions. In the damaged area there will take place fibrosis phenomena and of healing like answer to the received insult, what can give place to a capsular retraction in its most peripheral area. Between them we can quote the procedures of hepatic biopsy, the catheters laying percutaneous of drainage of hepatic abscesses and/or of the biliary route, as well as the percutaneous drainage and sclerosis of the hepatic cysts in the illness context polycystic.

In its diagnosis us the case history of the patient will be of maximum help. The image tests will show us in these cases a capsular withdrawal that will be in general small, focal and peripheral with regard to the damaged area, a hypoattenuated adjacent fibrosis area being visualized sometimes.

3. PSEUDORETRACTION
There are many entities that can imitate an authentic hepatic capsular retraction. That's why sometimes it can turn out to be complicated to distinguish between capsular retraction produced by real subcapsular injuries and the called hepatic pseudoretraction. Lobulation of the hepatic margin across the diaphragm, extrinsic compression by peritoneal implants, fibrous septa or the existence of normal hepatic parenchyma between masses that distorts the tumour margin and adjacent liver capsule across the same one, can imitate a real hepatic capsular retraction.

Fig. 12 Fig. 13 Fig. 14 Fig. 15

**Imaging findings OR Procedure details**

Images

**Images for this section:**
**Fig. 1**

**Fig. 2:** Hepatic metastases. Abdominopelvic CT with ivc in portal phase: transverse plane. The subcapsular only injury placed in LHD that shows a heterogeneous enhancement, with more hypodense areas in its interior and in its more peripheral region, which previous edge accompanies of capsular retraction. Note the presence of retrocrural mass / adenopatic conglomerate and in the root of mesentery; they infiltrate mesenteric vessels. Free intraabdominal fluid.
**Fig. 3:** Vascular invasion by metastases produces capsular retraction. abdominal MR ivc: HASTE with saturation (a) and EG T1 in phase (b). We observe a peripheral area of triangular morphology with vertex directed to the hilio, hypointense in EG T1 and hyperintense in HASTE, that provoke an alteration of the hepatic contour and capsular retraction. The above mentioned image corresponds to an infarct area in relation with vascular invasion by breast cancer metastases.
**Fig. 4:** Epithelioid hemangioendothelioma. Abdominopelvic CT with ivc in portal phase: transverse plane. There are multiple, peripheral, and different coalescer masses that concern both hepatic lobes, distorting the liver architecture, especially the right lobe. These masses appear hypoattenuated with areas of minimal and heterogeneous embossment and that they accompany of focal atrophy and capsular retraction.
Fig. 5: Multicentric cholangiocarcinoma. Abdominopelvic CT without contrast: transverse plane (a). Dynamic abdominal MR: EG with oily suppression without contrast (b), EG with oily suppression and contrast in portal phase(c) and 3D cholangiographic sequences (d). CT shows an extensive hypoattenuated area that occupies great part of the right lobe and part of the left. Contrast MR shows multiple nodular and heterogenous enhancing lesions. In 3D cholangiographic sequences we can see the amputation of the common hepatic duct and the branches of the first order of the biliary right tree, with distal dilatation.
Fig. 6: Giant haemangioma with ivc in portal phase: transverse plane. Hypocaptant mass in III-IV segment that presents nodular and peripheric enhancement, isodense to vessels, that corresponds to an atypical giant hepatic haemangioma, with central necrosis, which associates slight subcapsular retraction.
Fig. 7: Retractile fibrosis. Abdominal MR with ivc: transverse planes. HASTE (a), Vibe with ivc in arterial(a), portal (c) and equilibrium phase (d). Cirrhotic liver with bad delimited area in VIII segment, slightly hyperintense in T2, that presents a progressive enhancement and that corresponds with fibrosis zone, which is accompanied of capsular retraction.
Fig. 8: Retraction secondary to post-colangitis atrophy. Abdominal MR with ivc: transverse (a) and coronal HASTE planes(b) and coronal 3D (c). It is shown an irregular estenosis of the branches of the first and second order of biliary left tree, with distal dilatation and atrophy and with left lobe capsular retraction.
Fig. 9: Post-chemotherapy retraction secondary to colon metastases. Abdominopelvic CT with ivc: transverse plane in arterial (a) and portal phase (b). Subcapsular bad delimited lesion, placed in III-IV segment, hypodense in arterial phase and with predominantly peripheric enhancement in portal phase; the anterior edge presents capsular retraction and deformity of the hepatic contour.
**Fig. 10:** Post-chemotherapy retraction secondary to metastases. Abdominopelvic CT with ivc in portal phase: transverse plane. The left right turns out to be atrophic and retiring with marked hipoatenuation respect to adjacent parenchima secondary to the previous presence of metastasic lesion treated with chemotherapy. Additional another lesion visualizes metastastic of minor size and better delimited that also associates capsular retraction, placed in V-VIII segment.
**Fig. 11:** Secondary retraction to treatment with radio frequency for HCC. RM abdomen with civ: transverse court HASTE (a) and EG T1 in phase (b). In LHD there is visualized a nodular subcapsular area, which appears hipointensa in EG T1 and hyperintense in HASTE, by capsular adjacent retraction. Be observed also the presence of a new nodular injury iso or lightly hipointensa in segment the IIIrd, and another implant in fat perihepática in touch with area of capsular retraction.
Fig. 12: Pseudorretracción for implant in fat perihepática. RM abdomen with civ: transverse courts HASTE (a), EG T1 in phase (b) and Vibe with oily saturation and civ phase portal (c). Hipointensa visualizes a small nodular injury in T1, isointensa to the hepatic parénquima in HASTE and that catches contrast, placed in the fat perihepática previous to the segment the VIth that there contacts and provokes a pseudorretracción of the hepatic capsule the above mentioned level.
Fig. 13: Pseudoretraction by mass. Abdominopelvic CT with ivc in portal phase: transverse plane. Capsular pseudoretraction for presence of mass with exofitic growth, that can be misinterpreted as capsular retraction.
Fig. 14: Anatomical pseudoretraction. Abdominal MR with ivc: transverse plane HASTE. Alteration of the hepatic contour owed to the disposition of dome diaphragmatic.
**Fig. 15:** Pseudoretraction by fat umbilication. Ultrasound scan abdomen: transverse plane (a). Abdominopelvic CR with ivc: transverse plane in arterial (b) and portal phase(c). Ultrasound scan shows an hyperechoic and small nodular image, well delimited, placed in the periphery of the VI-VII segment, which shows an attenuation similar to the fat in the CT, provoking a slight capsular pseudo-retraction.
Conclusion

This pictorial review shows that retraction of the liver capsule is not a finding specifically associated with a hepatic tumour but may be seen in patients without a hepatic tumour, including those with confluent hepatic fibrosis, oriental cholangiohepatitis and bile duct necrosis.

References


Personal Information