

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



Spine MRI

Part 2

Dr. Mohamad Hasan Alkousy

Ass. Professor of Radiology

Sohag University

Multiple Sclerosis

Demyelinating disease affecting the W.M. of the brain & spinal cord.

Intramedullary demyelinated areas can present one of the 3 following appearances:

1-Segmental fusiform enlargement of the cord of limited extent (1:3 segments).

2-Focal hyperintense area without any morphological changes of the cord.

3-Cord atrophy (end stage disease).

These appearances may represent the same lesion at different stages.

Enlargement of the cord (seen in acute stage as hyperintense area) is due to perivenous inflammation, intersitial oedema and/or microglial proliferation.

Gad. uptake by active plaques is often seen on MR.

D.D. between M.S. and a cord tumor may be difficult as the abnormalities seen in M.S. are not specific.

However, M.S. plaques are often pencil shaped and occur preferentially in the dorsal and lateral segments of the cord.

On follow up, disappearance of the lesions / cord atrophy is commonly seen.

Case 1



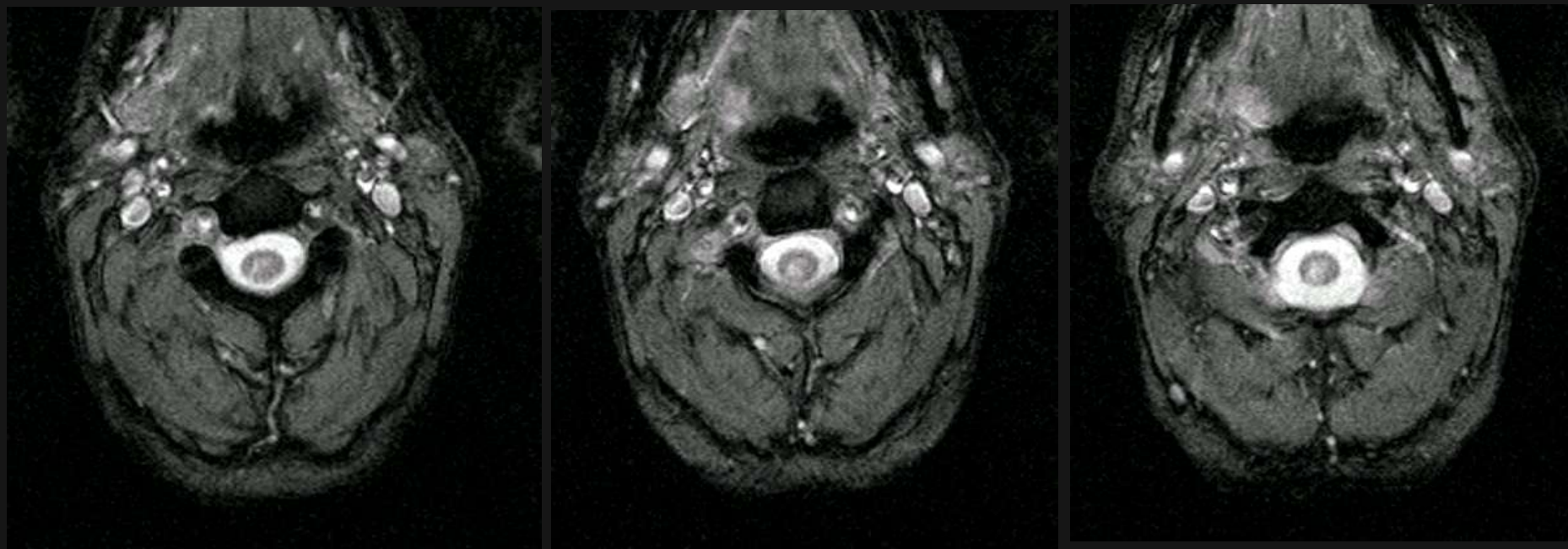
Sagittal T1. The spinal cord appears normal.

Sagittal PD. Although the contour of the cord cannot be evaluated here, abnormal signal within the spinal cord is visible at the C2 level

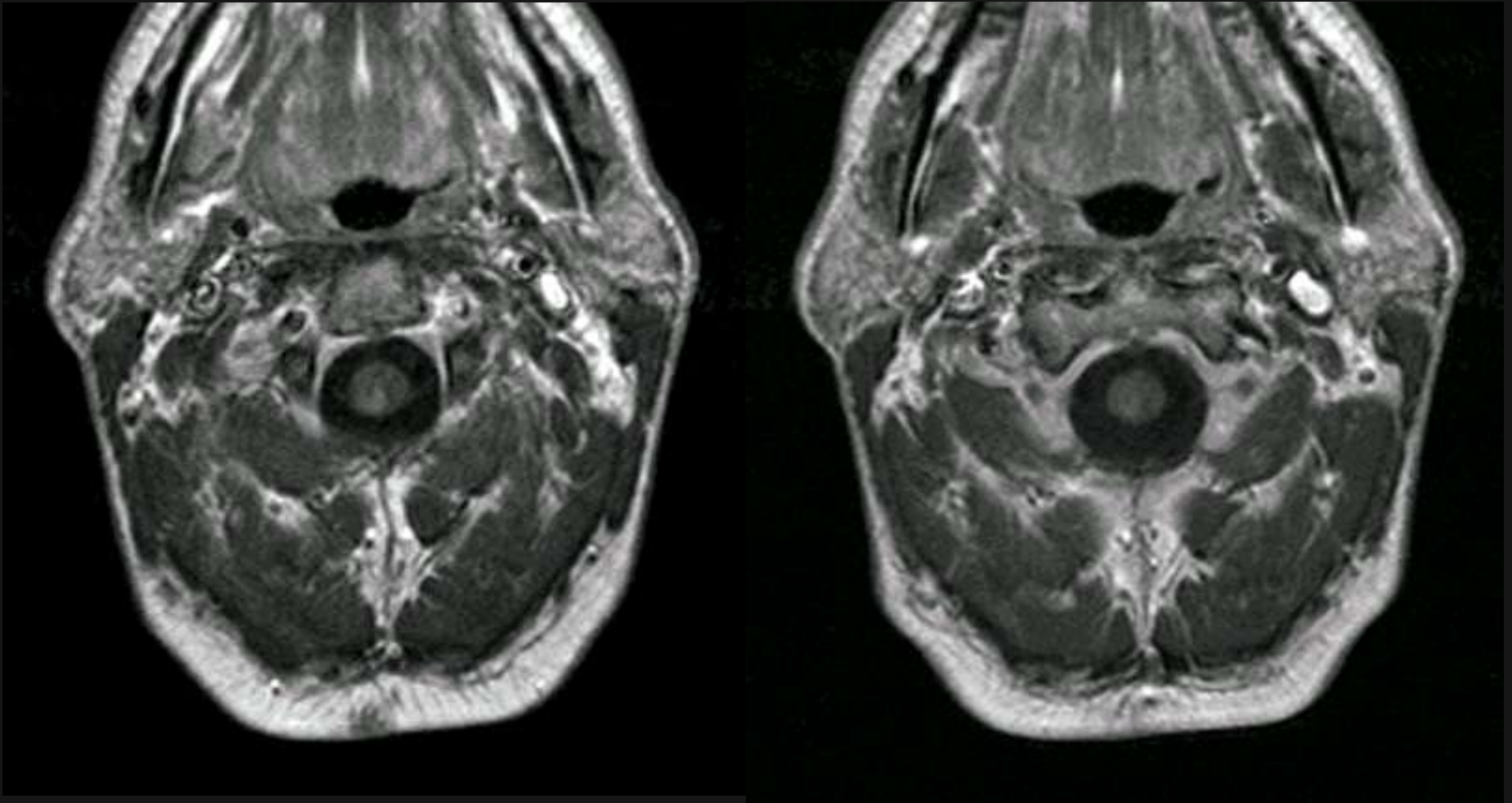


T2. Also nicely demonstrates high signal with the posterior half of the upper cervical cord. A smaller lesion is seen in the posterior aspect of the cord at the C6 level.

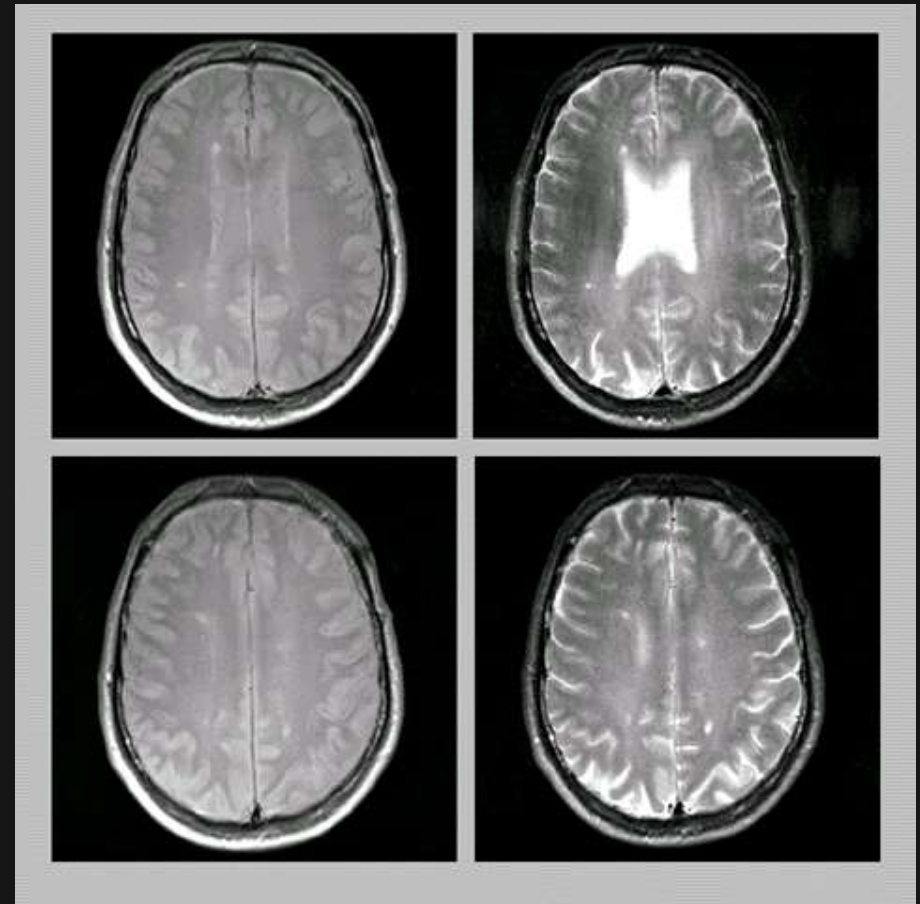
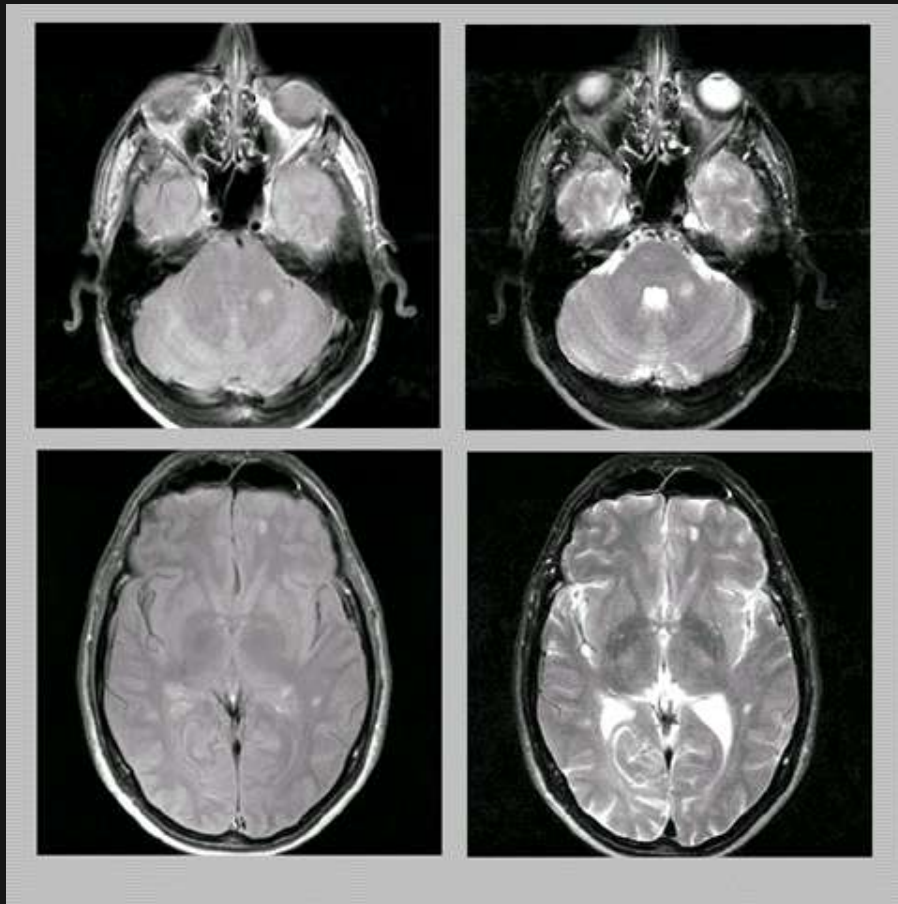
Gd T1 shows linear contrast enhancement of the C2 lesion



T2 confirm the unilateral and posterior location of the upper cervical plaque

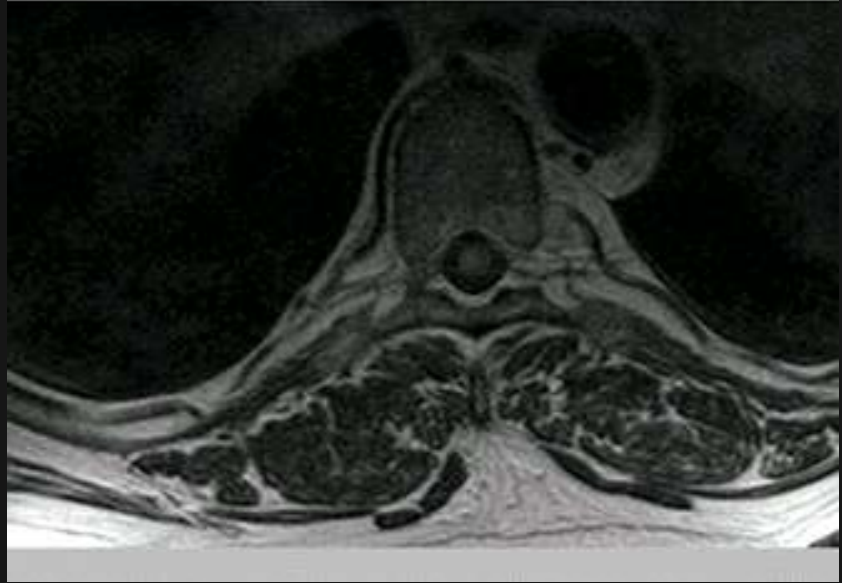
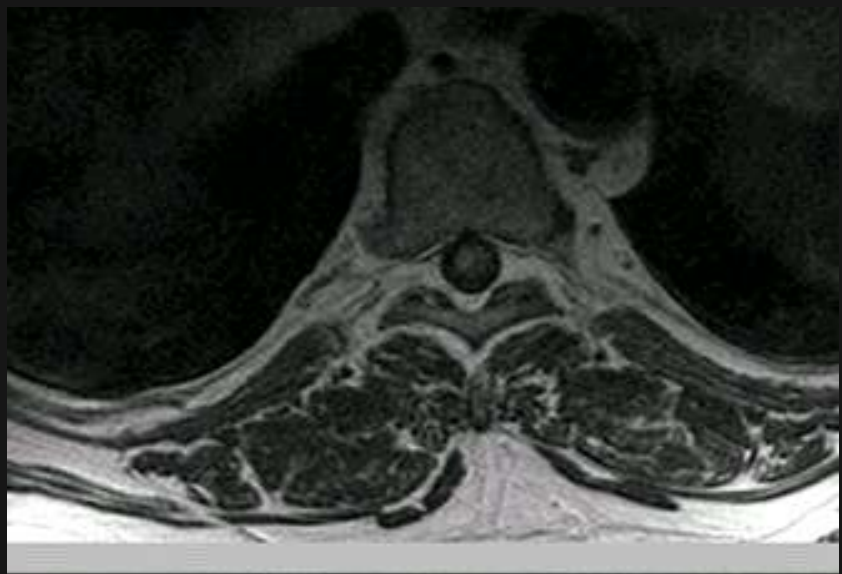


Gd T1 at the level of C2. The enhancing lesion involves the posterior Rt side of the cord

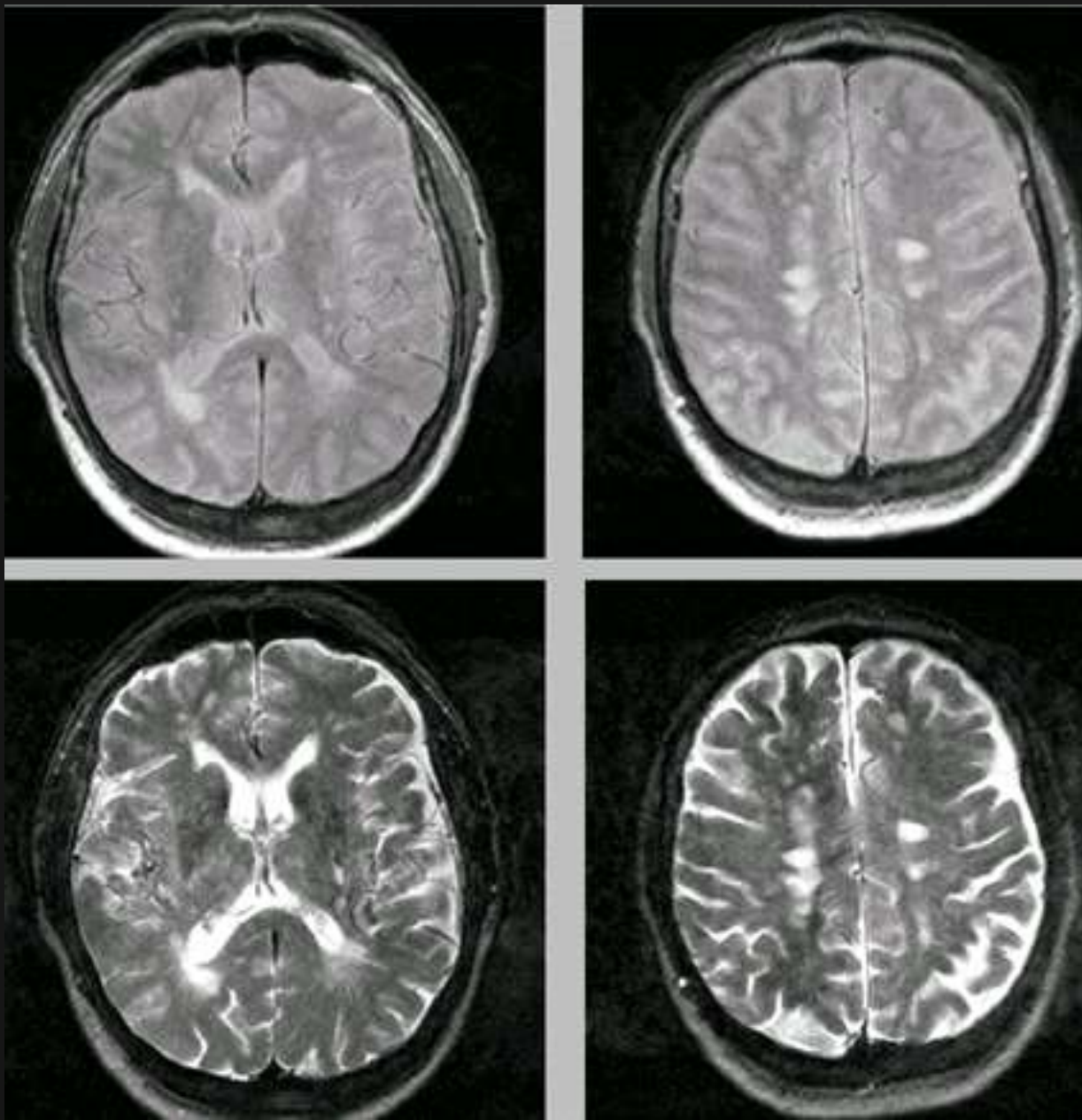


PD (Lt) & T2 (Rt). Multiple small areas of increased signal are seen within the white matter. (Note the classical location in the Rt frontal periventricular region as well as in the Lt middle cerebellar peduncle)

Case 2

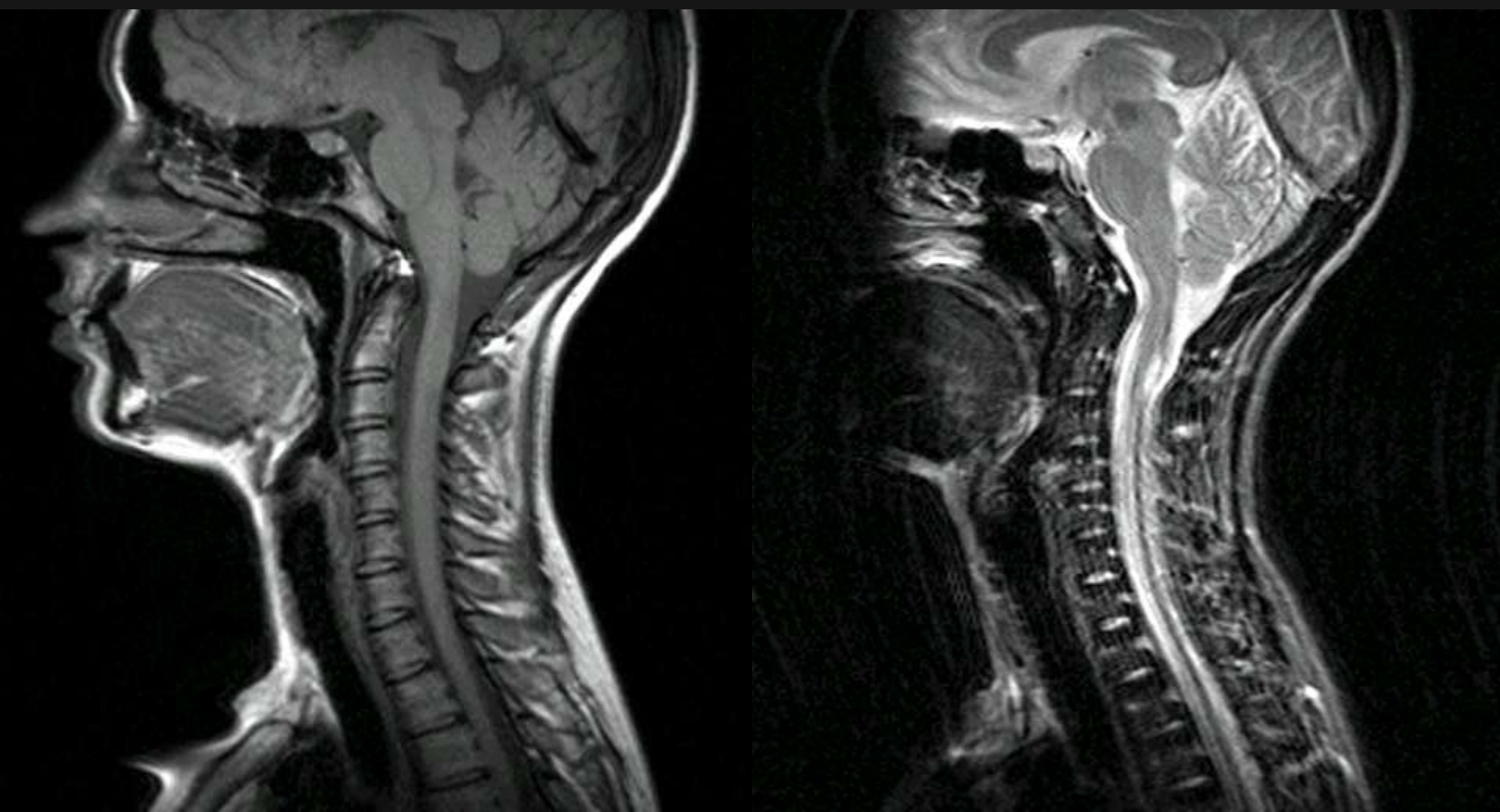


Gd. At this time, D.D. included a small 1ry spinal cord tumor, 2ry, an infectious lesion & MS. Brain MRI was performed and helped to provide the final diagnosis of MS, as multiple highly suggestive lesions were visible in the brain.



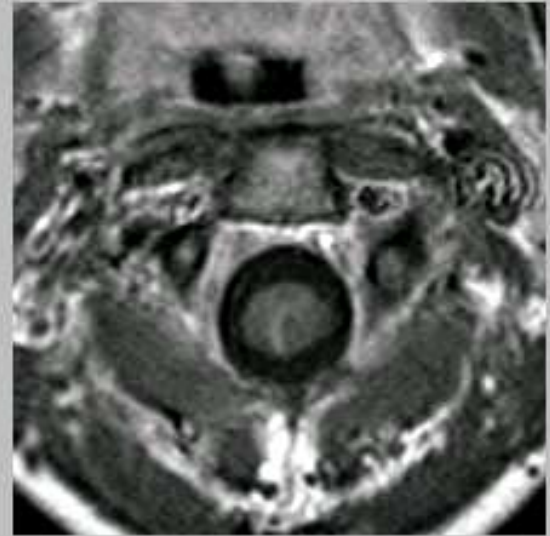
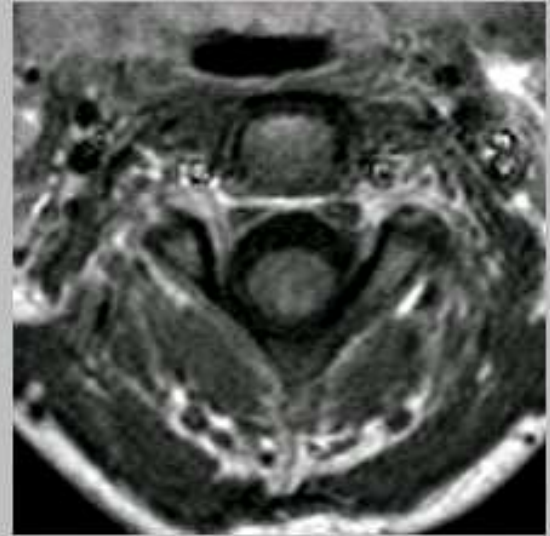
Axial PD and T2WI image

Case 3



T1. Discrete enlargement of the upper cervical cord.

T2. Although flow artifacts degrade this T2-weighted image, a high signal intensity lesion is clearly identified in the posterior half of the spinal cord at the C2 level



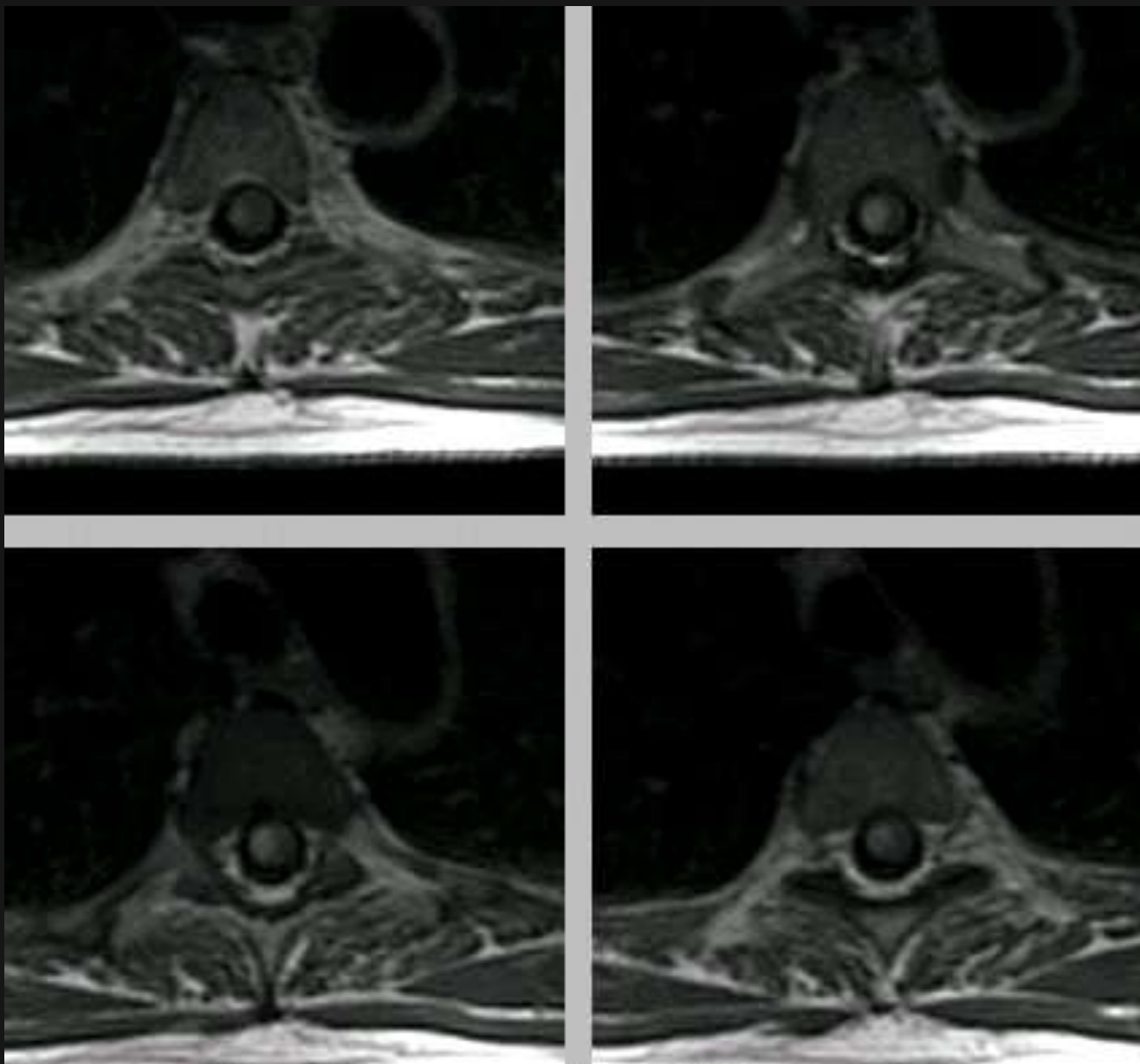
Gd. the lesion shows ring enhancement, confirmed on the axial images.

Axial Gd confirms the posterior location of this lesion, slightly offset to the Lt side

Case 4



Sagittal T1 and Gd T1. The spinal cord appears normal on non-enhanced T1. After Gad, an oval-shaped, well-defined lesion enhances homogeneously at the T3-T4 level.



Axial Gd T1. This confirms the intramedullary location of the lesion, limited to the Rt side of the cord



Sagittal T2 & PD. Mild spinal cord enlargement, with an ill-defined hyperintense appearance of the upper thoracic cord

D.D.included astrocytoma, an inflammatory lesion, and MS

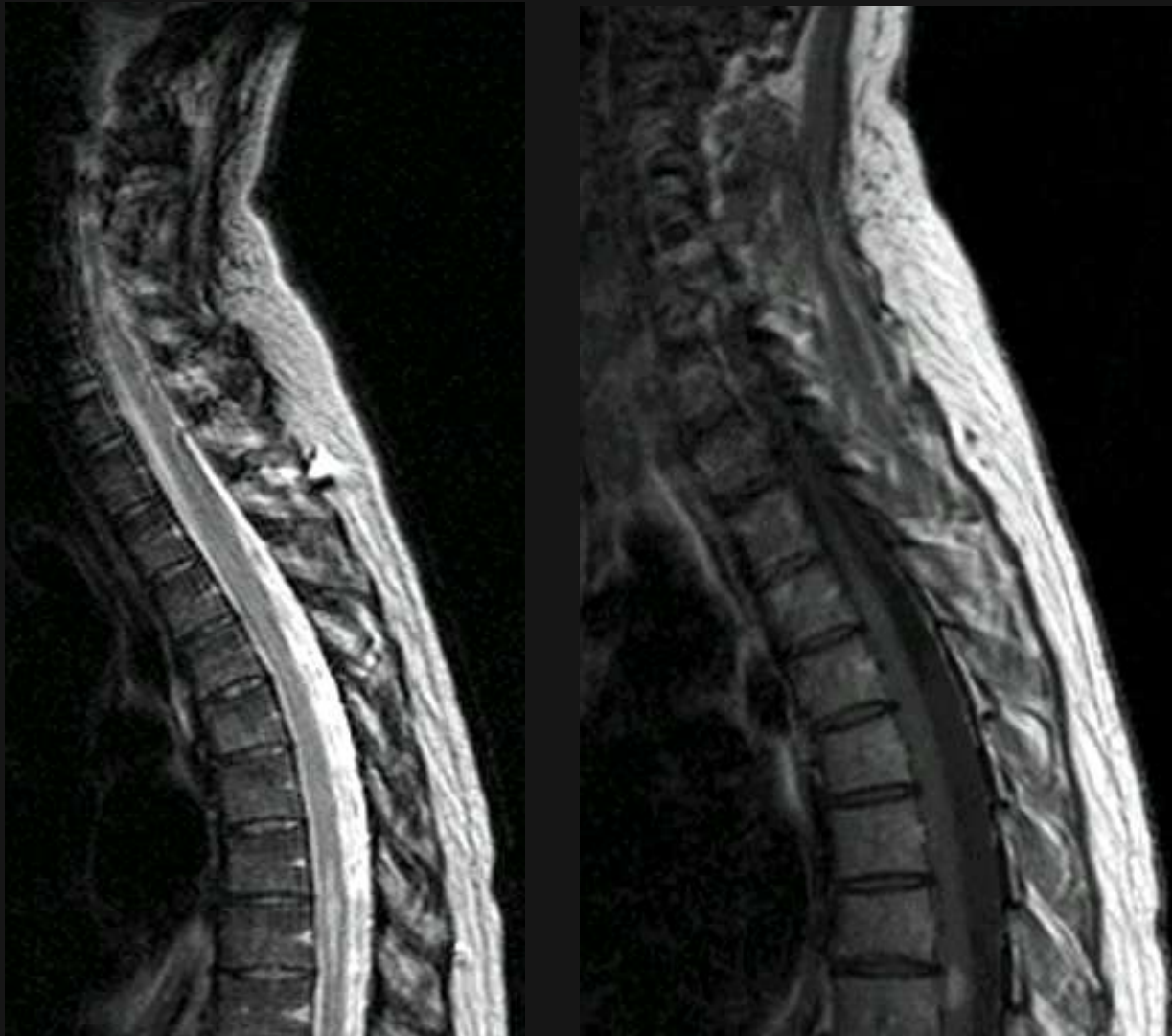
Case 5



T1. No definite abnormalities are seen

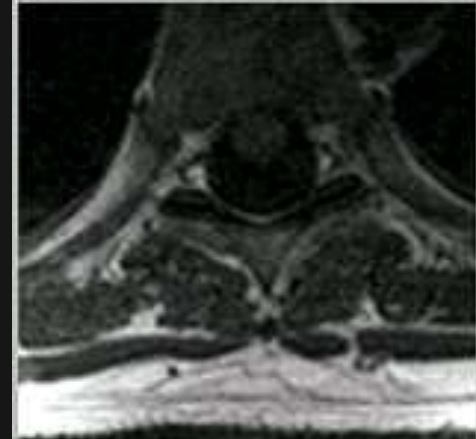
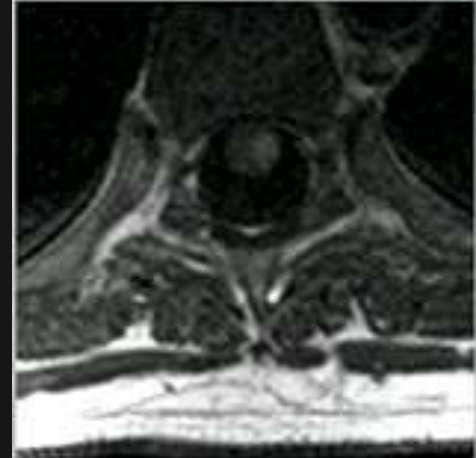
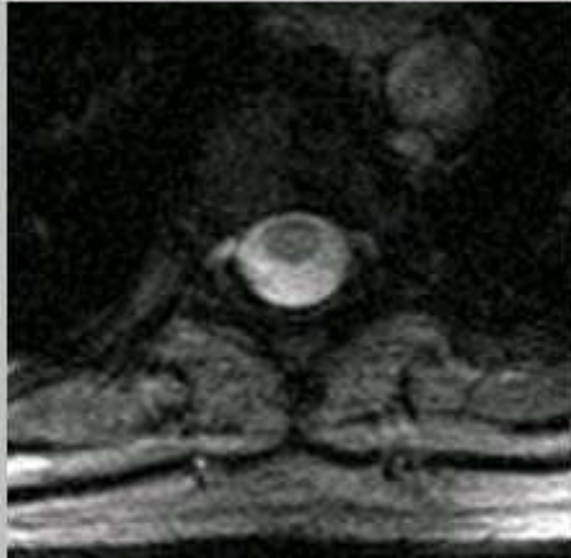
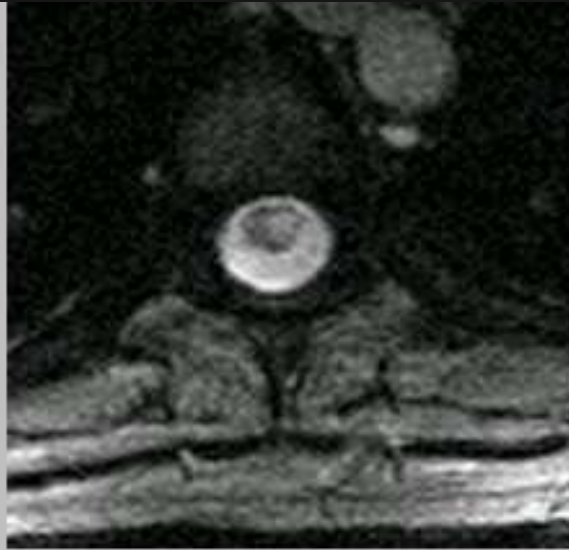
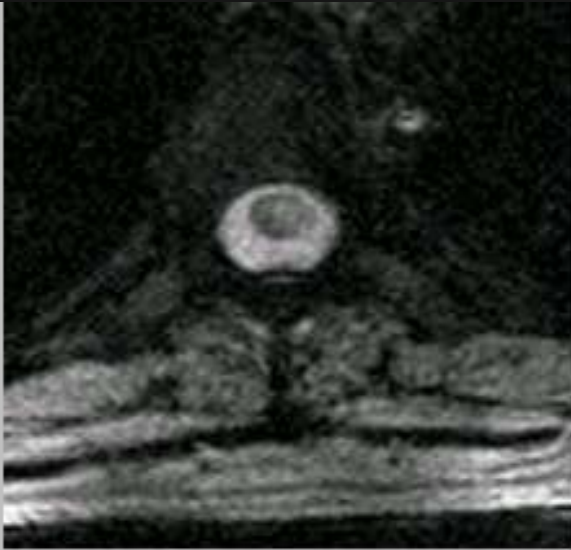


Sagittal T2. There is a questionable high-signal lesion in the conus, and a definite hyperintense area in the thoracic cord, seen at the top border of the image, confirmed on the next image

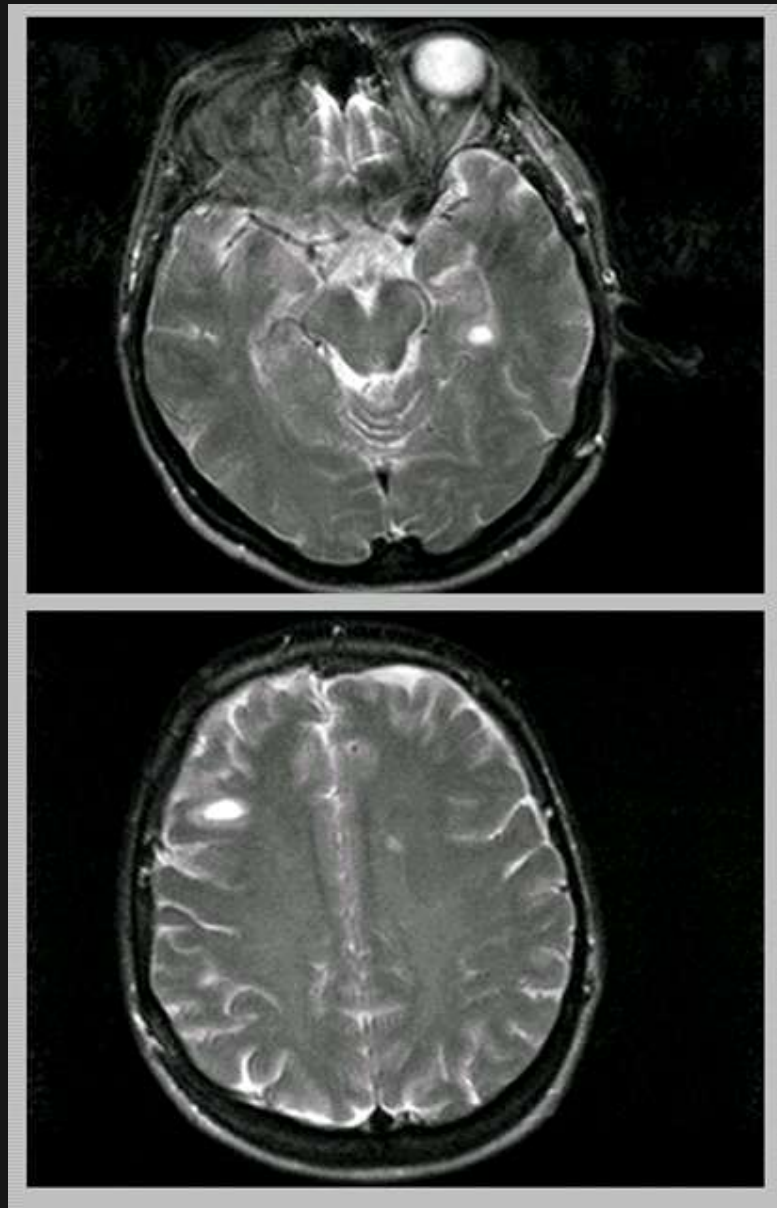


T2 centered on the upper thoracic and cervical spinal cord. A pencil-shaped hyperintense lesion is seen, anteriorly located at the T7-T8 level

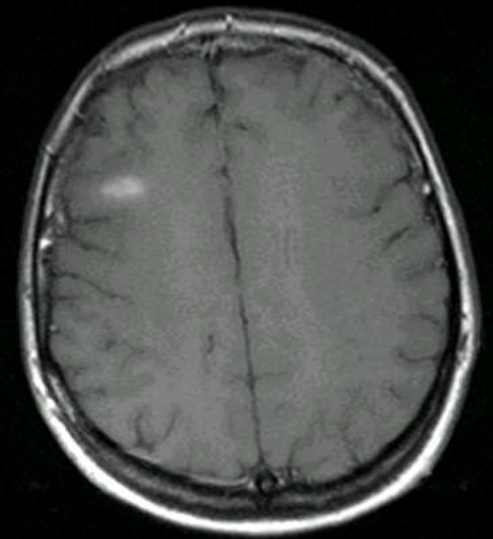
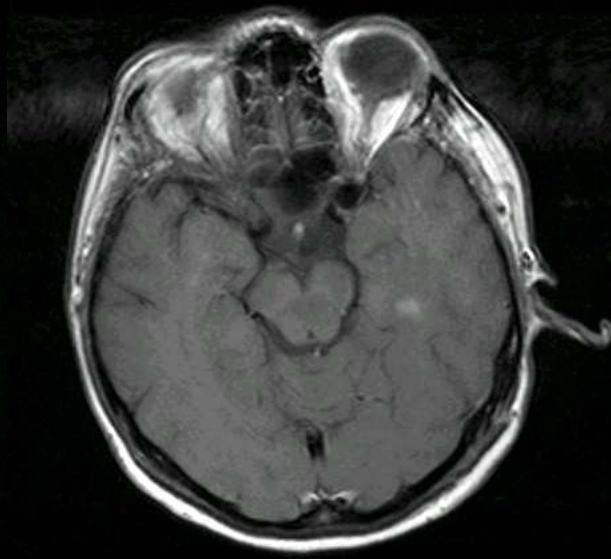
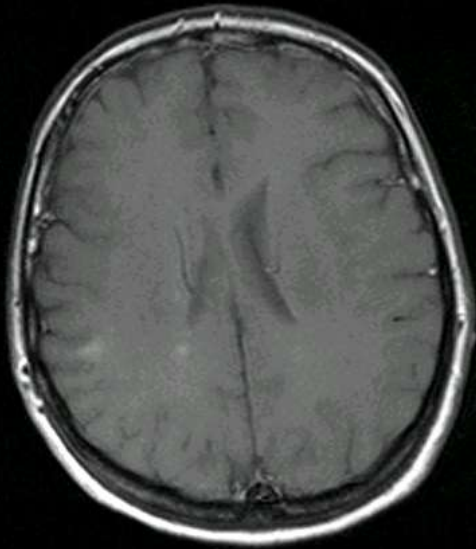
Gd T1 shows contrast enhancement of the thoracic lesion



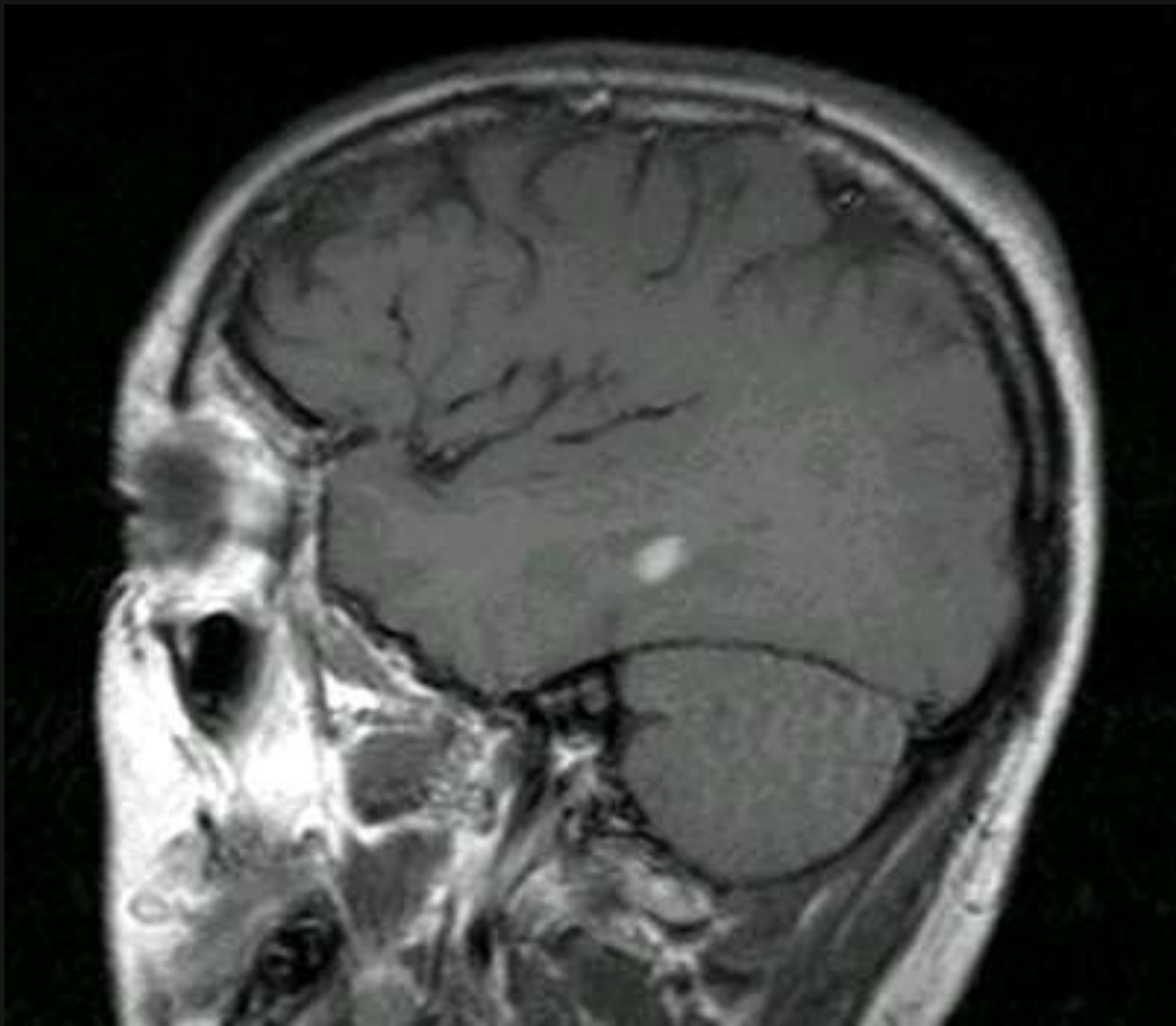
T2 and Gd T1 confirm the thoracic lesion,
restricted to the left side



T2 shows Lt temporal and Rt subcortical frontal lesions, consistent with MS



Gd T1 of the brain show enhancement of all cerebral lesions as well



Gd T1 show enhancement of all cerebral lesions as well

Sarcoidosis

Rare in the spinal cord.

Nodular lesion which usually strongly enhances.

Should be included in the D.D. of a nodular lesion.

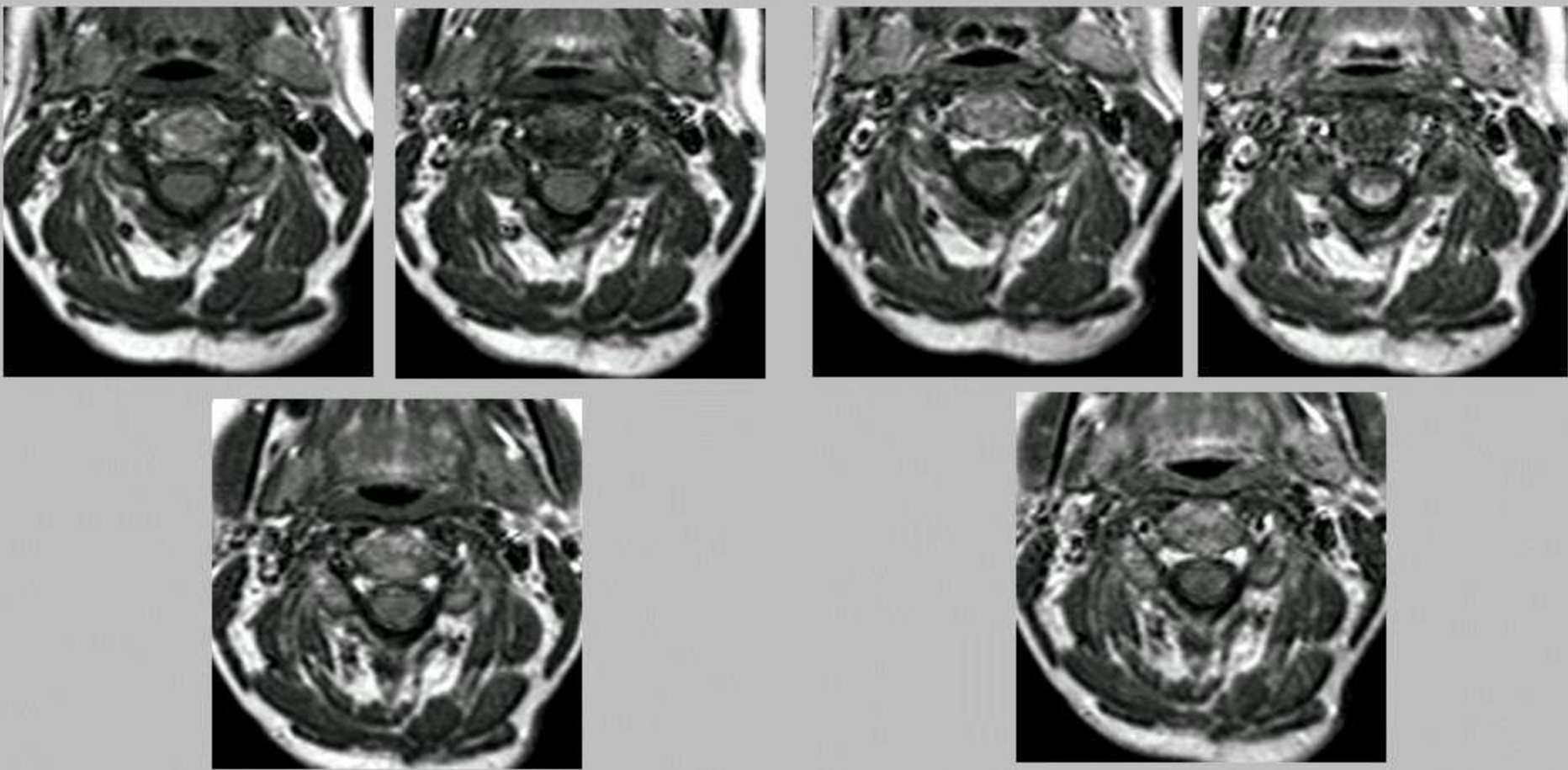




Sagittal T1WI. The cervical spinal cord is enlarged at C2-C6, with inhomogeneous, slightly hypointense signal



Sagittal Gd T1WI show a focal patchy area of intense contrast enhancement within the spinal cord at the level of T3-T4



Axial T1WI confirms cord edema.

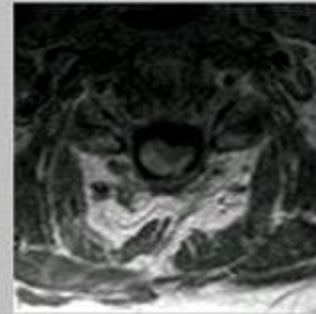
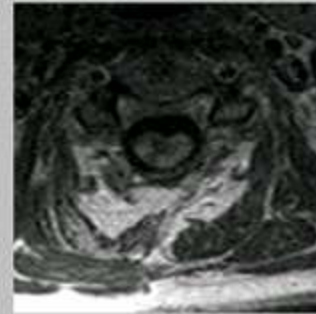
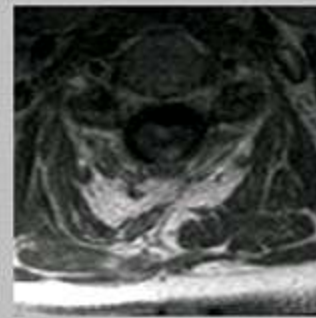
Image 5: Axial Gd T1WI demonstrates the precise location of the intramedullary zones of enhancement

Follow up



T1. Persistent enlargement of the spinal cord, heterogeneously decreased signal characteristics.

Gd. Contrast enhancement is still identified at the C3-C4 level



T1. Persistent enlargement of the spinal cord, heterogeneously decreased signal characteristics.

Gad. Contrast enhancement is still identified at the C3-C4 level

Tuberculoma

Although TB is the most common cause of vertebral body infection, intramedullary tuberculomas are very rare.

Tuberculomas are relatively small well defined lesions.

Intense enhancement.

Signal characteristics are not specific.

Abscess

Intramedullary abscesses are extremely rare.

Centromedullary location.

Extended over 3 vertebral segments.

Enhanced after Gad.

Surrounded by extensive edema.

ADEM

Rare demyelinating condition occurring after viral infection, vaccination, or spontaneously.

Usually it is a monophasic disease.

Clinical manifestations may begin with fever, headache, and signs of meningeal irritation.

Lesions are the result of an autoimmune response against antigens in the CNS, usually arising following a viral infection.

Lesions are typically in the W.M. but can also occur in basal ganglia.



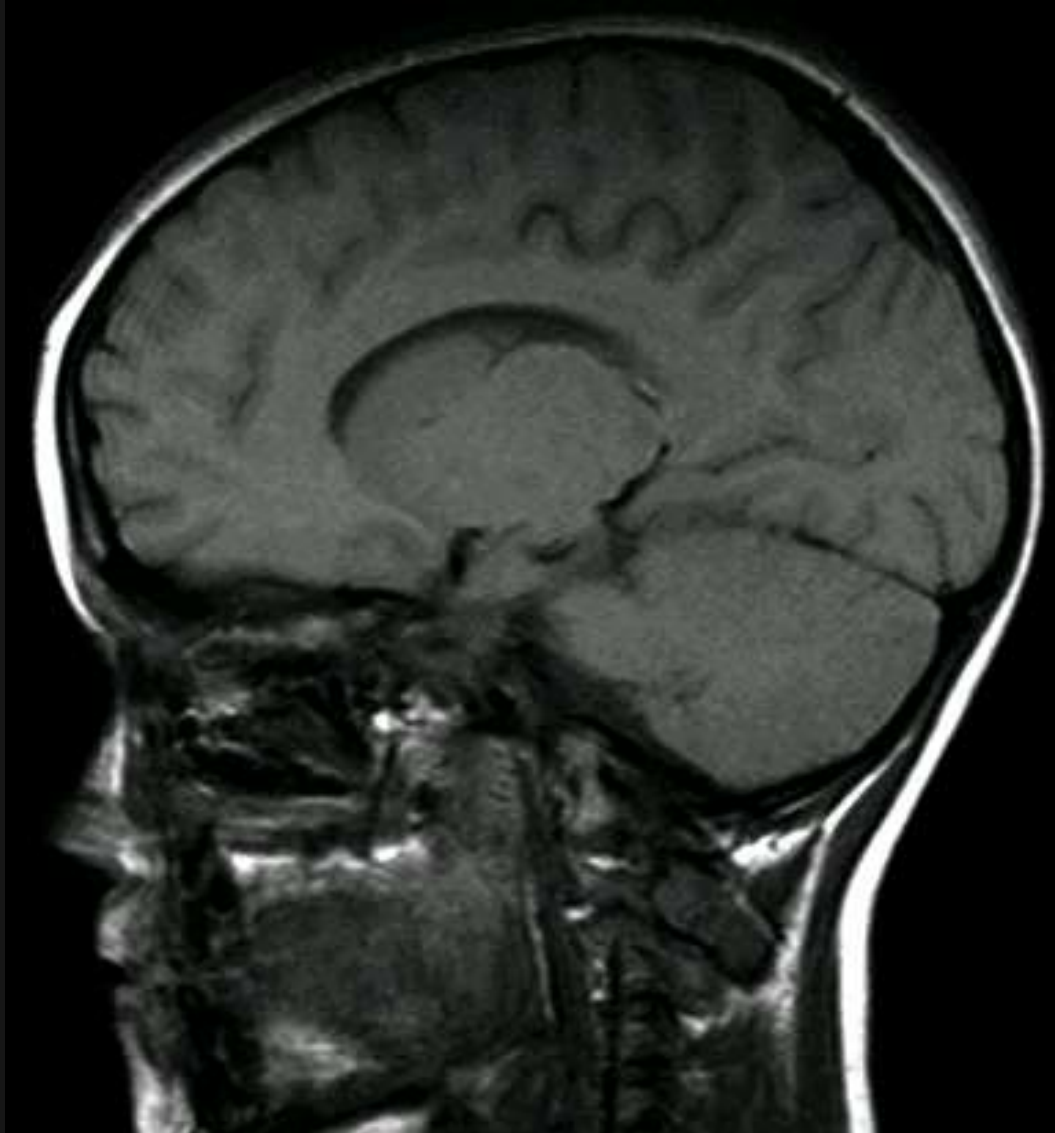
Sagittal T1WI. Irregular multisegmental enlargement of the spinal cord, sparing the cervico-thoracic junction, with diffusely heterogenous signal characteristics.



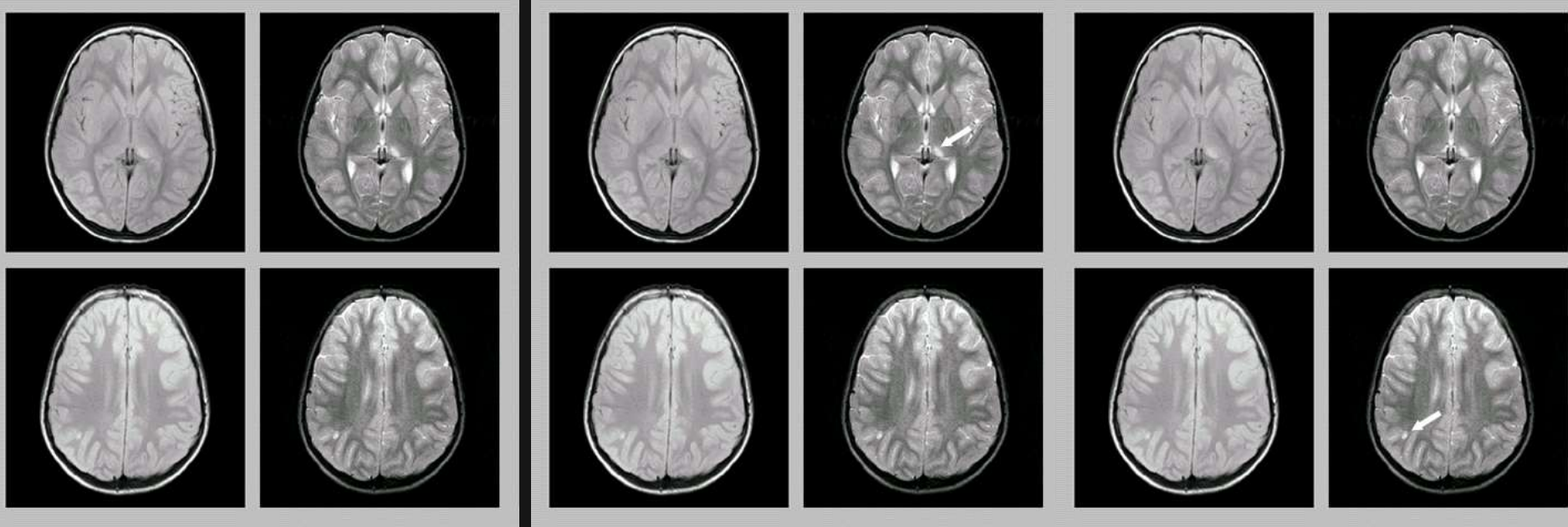
Gd T1WI. Multiple inhomogeneously enhancing foci (see -->), sparing only the C6-T1 segment, which remains normal in size



Axial Gd T1WI. Enlargement of the spinal cord with an ill-defined area of contrast enhancement in the left half of the cord, mainly located in the white matter



Sagittal T1WI of the brain. Small hypointense lesion in the posterior thalamic region, better seen on image 6



Axial PD and T2WI of the brain. The posterior thalamic lesion is seen as a high signal intensity lesion (see -->). A second lesion is visible in the right subcortical parietal white matter

These cerebral lesions did not enhance after Gd injection

1st Follow up



T1 & PD. Regression of the multiple spinal cord and cerebral lesions, although still faintly visible



T2. Regression of the multiple spinal cord and cerebral lesions, although still faintly visible



Sagittal Gd, Axial PD & T2. Regression of the multiple spinal cord and cerebral lesions, although still faintly visible

2nd Follow up



Gd T1WI. The spinal cord and brain now appear essentially normal

AVM, Dural fistula

Spinal cord AVM include AVM with a nidus & direct AVF.

Spinal dural AVF is extramedullary lesion.

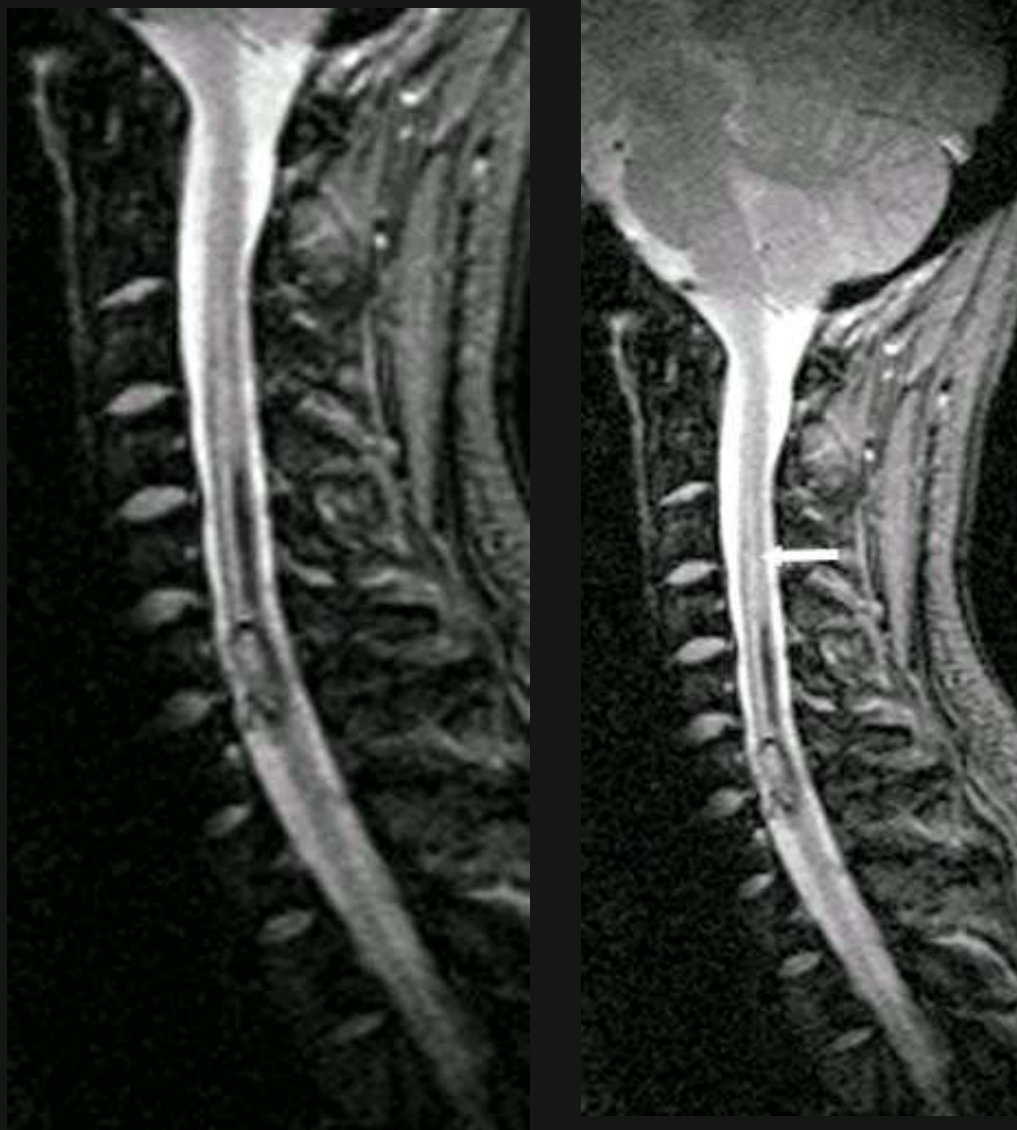
MRI shows AVM as hypointense serpentine filling defects on T1 & T2 due to vascular flow phenomena.

T2 can also show an extensive intramedullary hyperintense areas thought to represent spinal cord edema.

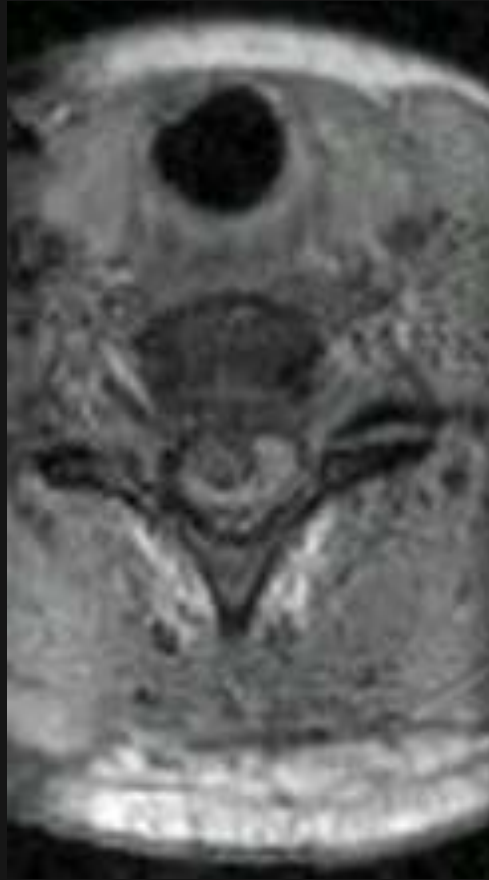
Case 1



Sagittal T1WI, obtained from a 3D gradient echo acquisition. Cervical spinal cord AVM with right anterior nidus, seen as a well-delineated hypointense area



Sagittal T2WI. The cervical spinal cord AVM with right anterior nidus is again seen as a hypointense lesion. Associated edema is visible as a hyperintense area within the cervical cord



Axial T1WI and image 6: Coronal T1WI reformatted images help identifying the right anterior nidus within the spinal cord at the C6 level

Case 2



T1, PD, T2. These images raise the question of the presence of abnormal vascular elements in the perimedullary area



Sagittal Gd T1WI. Shows abnormal contrast enhancement within enlarged vessels surrounding the anterior and posterior surface of the cord



Sagittal Gd T1WI (see -->) and image 14: Sagittal Gd T1WI. These images disclose extensive dural AVM at the posterior surface of the mid- and lower spinal cord

Case 3



Gd T1WI. An enhancing mass lesion is seen in the conus



Gd T1WI. The conus is enlarged

Follow up

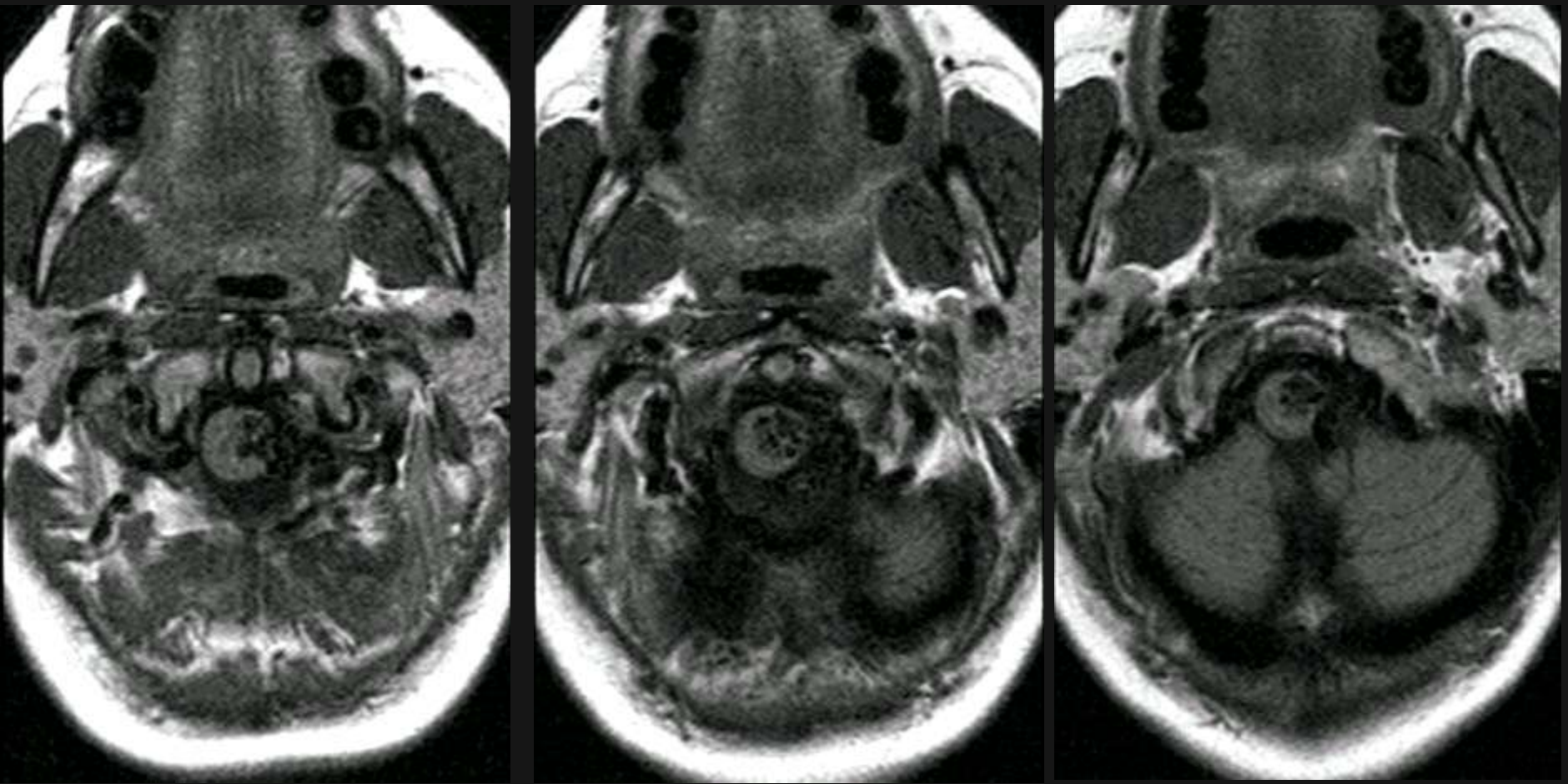


Sagittal T1

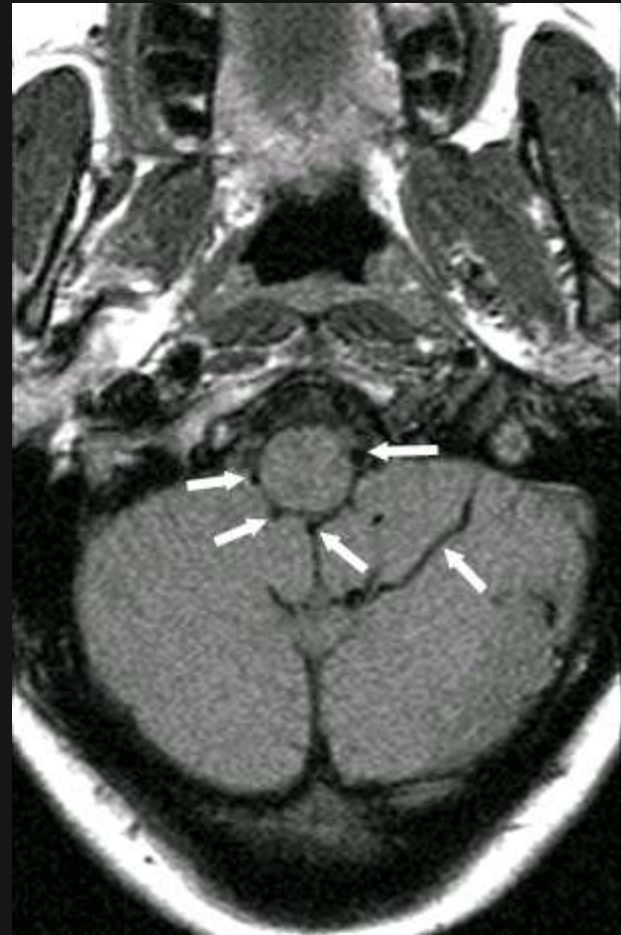
Case 4



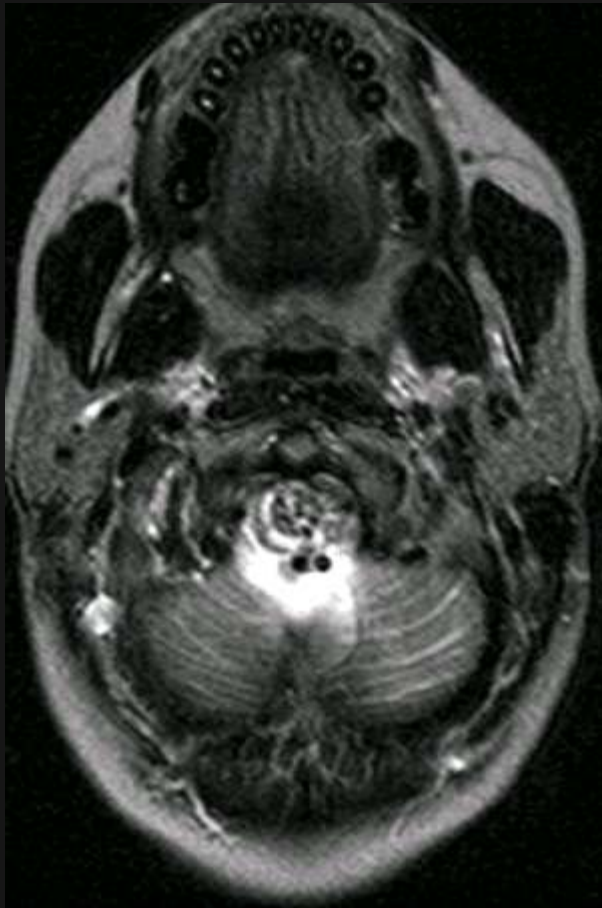
T1WI. Focal enlargement of the upper cervical spinal cord is seen, due to a well-delineated, although irregular, hypointense lesion. This appearance is strongly suggestive of a lesion containing dilated vascular components



T1WI of the upper cervical cord and inferior posterior fossa. These images show that the lesion is restricted to the upper left part of the spinal cord. Again, dilated vessels can clearly be identified



T1WI of the upper cervical cord and inferior posterior fossa. These images show that the lesion is restricted to the upper left part of the spinal cord. Again, dilated vessels can clearly be identified



T2WI. Confirm that the lesion is composed of vascular elements (flow void phenomenon).

An arteriovenous malformation was strongly suspected on basis of these images and complementary MR angiography was performed

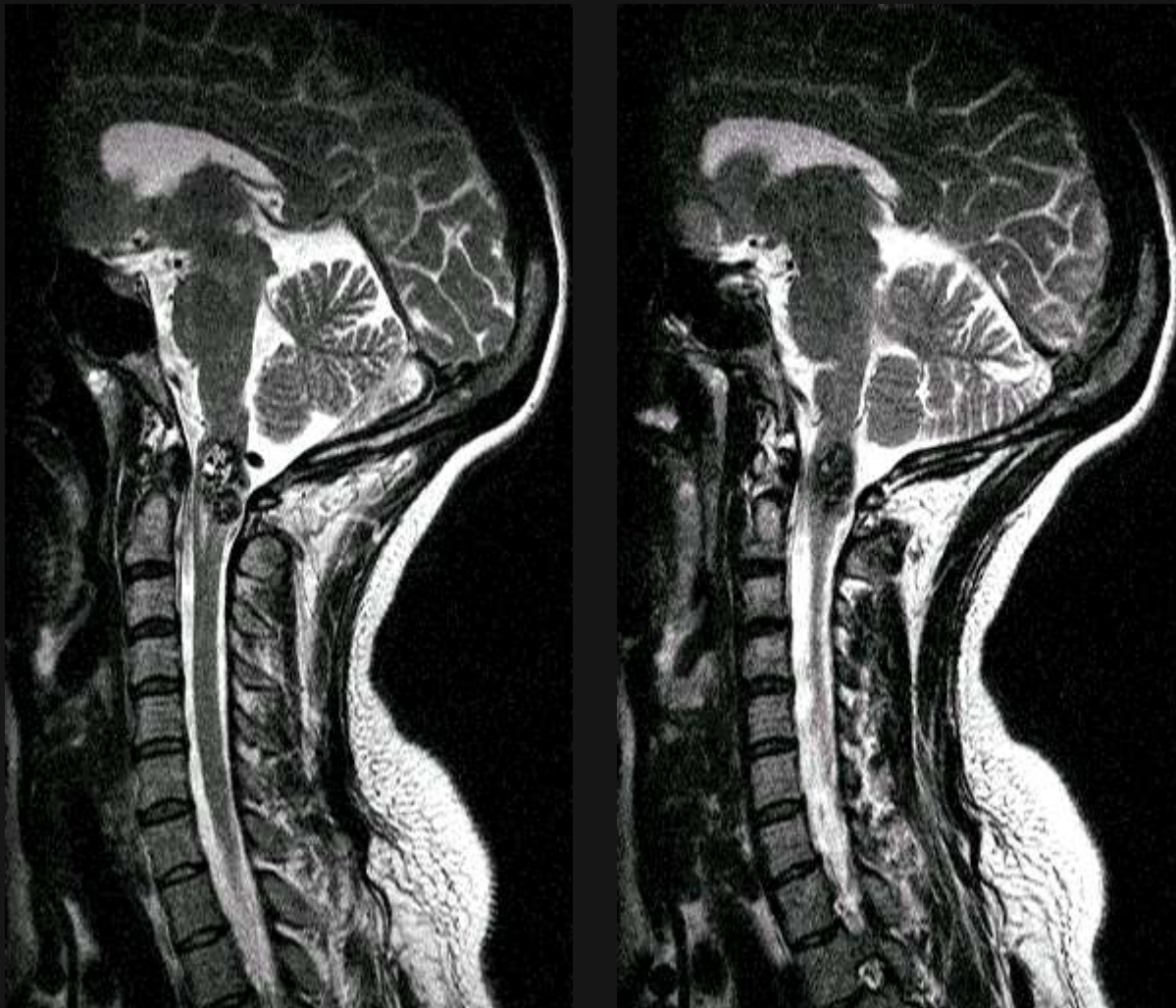
Follow up



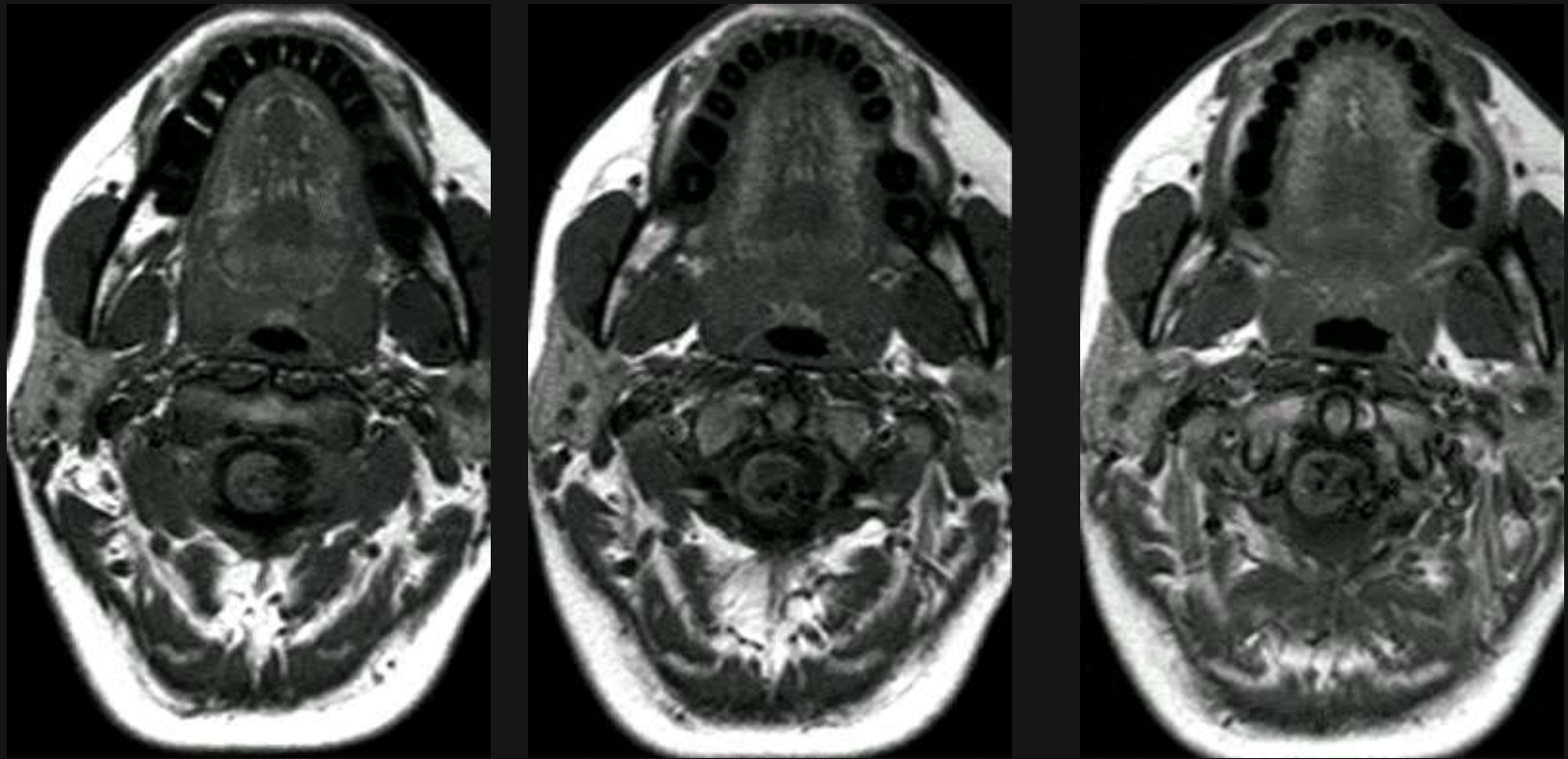
T1 No major changes are observed as far as the size of the lesion is concerned. Associated edema is reduced and a small hyperintense focus is now seen within the lesion on the T1-weighted image (image 12), corresponding to a small hemorrhage



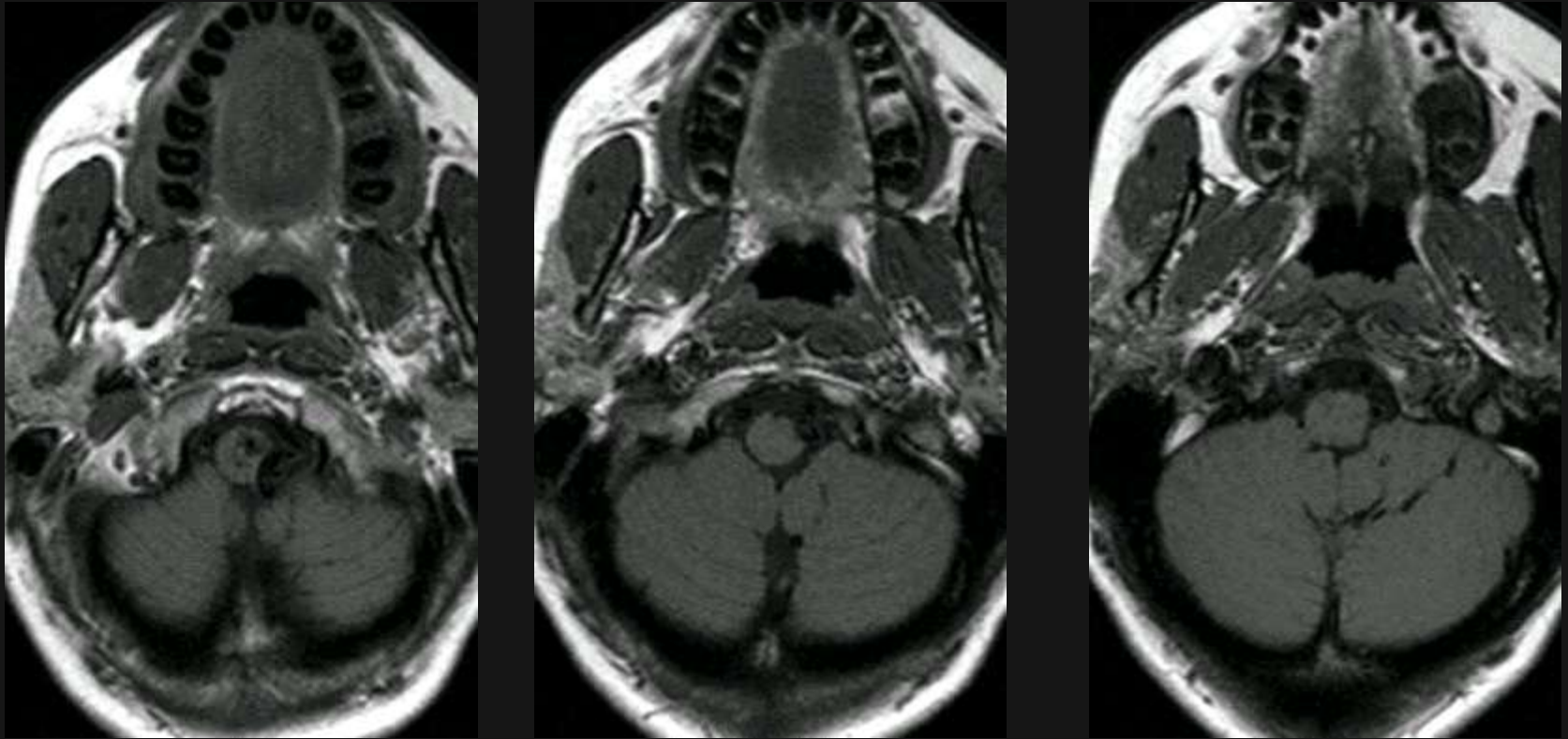
T2 No major changes are observed as far as the size of the lesion is concerned. Associated edema is reduced and a small hyperintense focus is now seen within the lesion on the T1-weighted image (image 12), corresponding to a small hemorrhage



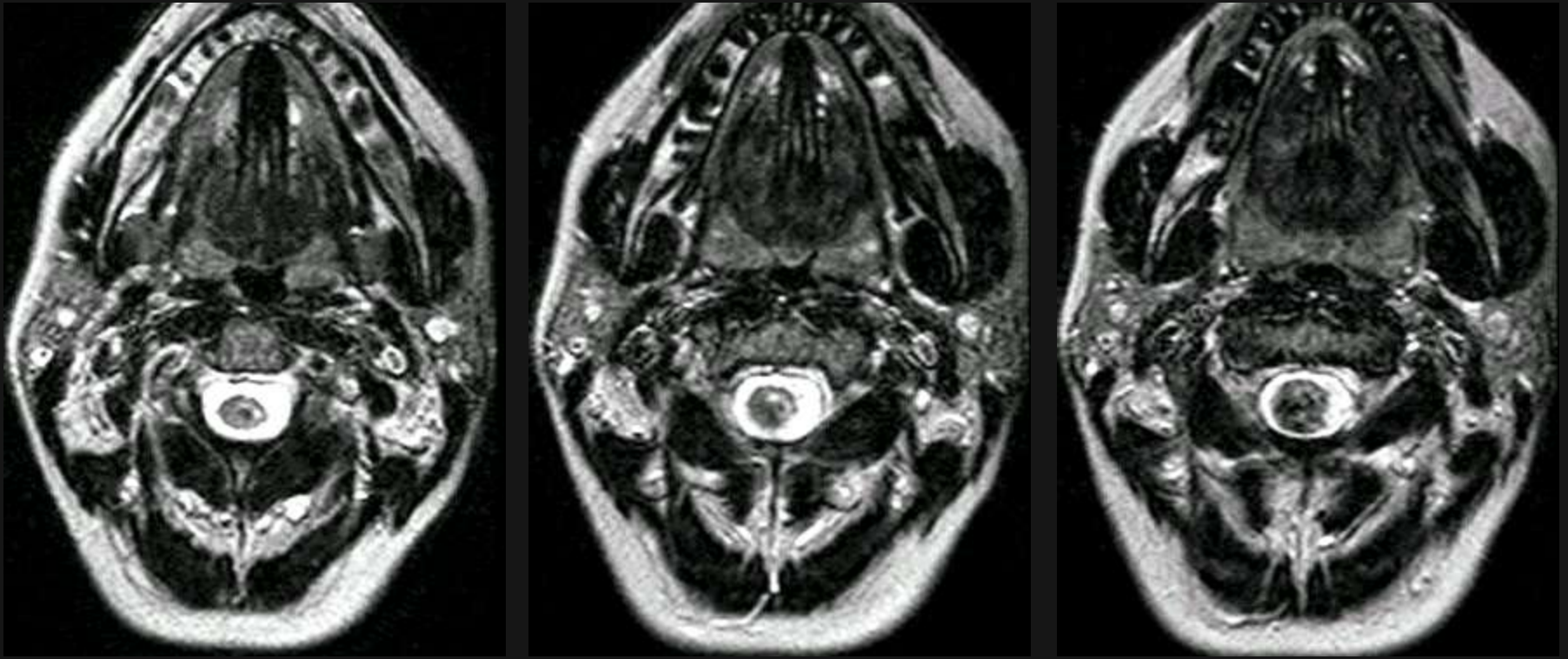
T2 No major changes are observed as far as the size of the lesion is concerned. Associated edema is reduced and a small hyperintense focus is now seen within the lesion on the T1-weighted image (image 12), corresponding to a small hemorrhage



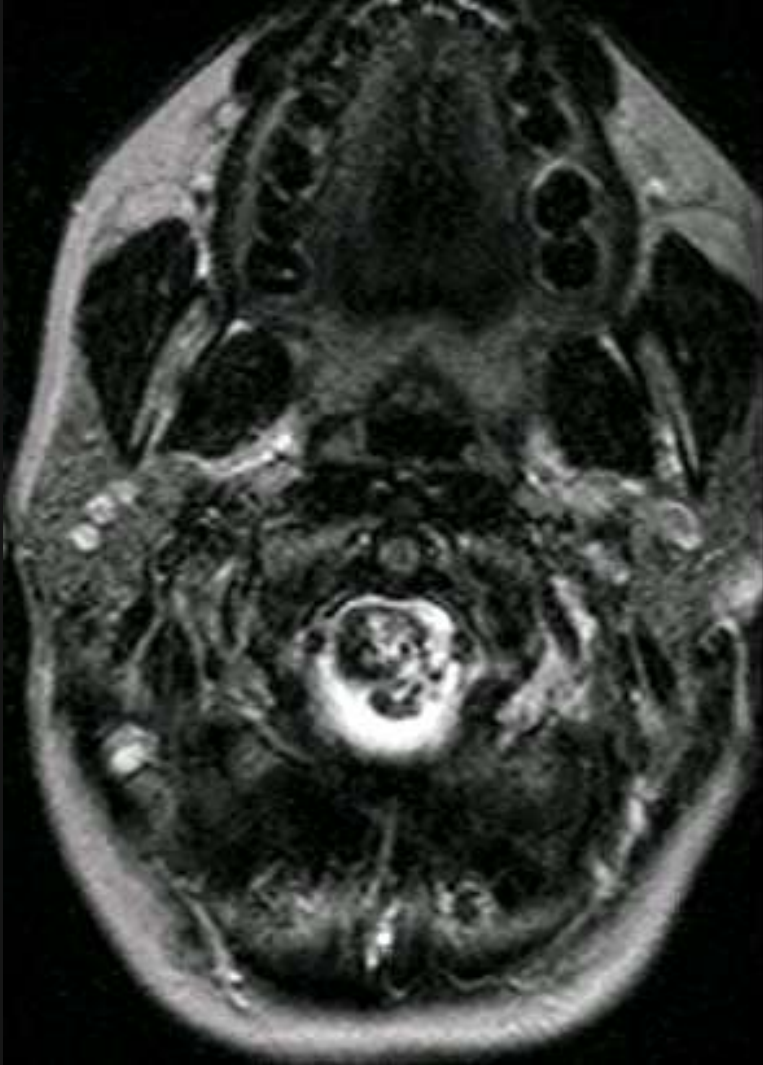
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A large field of tulips in various colors (orange, pink, red) with a tree in the background. The tulips are arranged in rows, and the colors transition from orange in the foreground to pink and then red towards the background. A large tree with pink blossoms is visible in the distance. The text "Thank You" is overlaid in the center of the image.

Thank You