Torticollis in pediatric patients: Role of Magnetic Resonance Imaging in the etiological diagnosis.

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Aims and objectives

Show the common and uncommon causes of craniocervical pathology in pediatric patients with torticollis.

Analyze the diagnostic role of Magnetic Resonance (MRI) and our torticollis management protocol.
Methods and materials

Between January 2008 and July 2014, 60 patients aged 0 to 16 years old attended the Emergency Room of our hospital suffering from torticollis as the main symptom. We ruled out 7 cases with congenital muscular torticollis.

The torticollis management protocol of our hospital was applied in the remaining 53 cases, the sample of our study. A complete anamnesis was made, searching for other concomitant symptoms or clinical signs that could help finding the cause of the torticollis.

Our protocol is based on 3 admission criteria and their imaging test requirements (Table 1).

If MRI is required, due to pathological findings on urgent CT or in case of criteria 2 or 3, our Radiology Department is always capable of responding in less than 20 days.

Following our protocol, MRI of the brain and cervical spine was indicated in 30 patients, as described in Table 2.
Table 1: Our torticollis management protocol in pediatric patients

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<table>
<thead>
<tr>
<th>ADMISSION CRITERIA</th>
<th>IMAGING TEST REQUIREMENTS</th>
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<tbody>
<tr>
<td>1. Pathological finding in neurological examination</td>
<td>Urgent Brain CT Scan</td>
</tr>
<tr>
<td>2. Subacute torticollis (&gt; 5-7 days of evolution) that does not improve after correct treatment</td>
<td>No urgent CT required. AP and L Neck Radiographs followed by Bone scan. If Bone scan is negative, a craniocervical MRI will be performed.</td>
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<tr>
<td>3. Recurrent torticollis</td>
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Table 2: MRI requirements in our sample according to the protocol applied

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<table>
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<tr>
<th>MRI REQUIREMENTS ACCORDING TO OUR PROTOCOL</th>
<th>NUMBER OF CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subacute torticollis (criteria n° 2)</td>
<td>17</td>
</tr>
<tr>
<td>Concomitant neurological symptoms (criteria n° 1)</td>
<td>8</td>
</tr>
<tr>
<td>Recurrent torticollis (criteria n° 3)</td>
<td>5</td>
</tr>
</tbody>
</table>
Results

MRI was abnormal in 18 patients (60%) (Fig. 1).

The most frequent findings were congenital vertebral abnormalities with 7 cases (40%) (Table 3); followed by intracranial tumors in 3 patients (17%): a pilocytic astrocytoma, an hemangioblatoma and an ependymoma; and bone tumors in 2 cases (11%): both osteoid osteomas. We found 2 patients with acute disseminated encephalomyelitis, 1 patient with syringomyelia, 1 with spondylodiscitis, 1 with retropharyngeal abscess and 1 with disc calcification (Fig. 2).

After diagnosis by MRI, 5 patients (27%) required surgery: the 3 brain tumors were surgically removed and 2 congenital vertebral abnormalities, an atlas assimilation and a atlanto-axial subluxation, were treated by arthrodesis, with a good recovery.

The other 5 cases of congenital vertebral abnormalities were treated conservatively with anti-inflammatory drugs, presenting clinical improvement. In one case of atlanto-axial subluxation, another MRI was made one month after, without demonstrating abnormalities.

We do not have data of the management or evolution of the patient affected by syringomyelia due to referral to another center.

The two cases of bone tumors and the case of disc calcification were treated with analgesia and anti-inflammatory drugs, with good clinical recovery.

The two cases of encephalomyelitis and the case of spondylodiscitis were treated with intravenous antibiotics, resulting in complete resolution of the disease.

The retropharyngeal abscess was treated by drainage, with good recovery and resolution.

The 12 patients with normal MRI and the remaining 23 patients who did not undergo MRI evolved favorably. In those cases, the most frequent causes of torticollis were related to the ENT area, such as pharyngitis and cervical adenitis.
Images for this section:

**Fig. 1**: Performance of MRI following our torticollis protocol in our sample

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<table>
<thead>
<tr>
<th>CONGENITAL VERTEBRAL ABNORMALITIES</th>
<th>Nº</th>
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<tbody>
<tr>
<td>Atlas assimilation</td>
<td>2</td>
</tr>
<tr>
<td>Klippel-Feil syndrome</td>
<td>2</td>
</tr>
<tr>
<td>Atlanto-axial subluxation</td>
<td>2</td>
</tr>
<tr>
<td>Atlanto-occipital dysplasia</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>7</strong></td>
</tr>
</tbody>
</table>
**Table 3:** Congenital vertebral abnormalities in our study

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**Fig. 2:** Craniocervical pathology causing torticollis in our sample

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Fig. 3: 22 months-old infant suffering from torticollis of 10 days of evolution as the only symptom. MR: A, B, C and D) Axial FLAIR sequence. Large tumor in the left cerebellopontine angle, growing towards the brainstem and extending to the occipital foramen. E, F and G) Coronal T1 after gadolinium injection shows weak contrast enhancement. There is an important mass effect on IV ventricle with hydrocephalus. Radiological diagnosis of ependymoma, histologically confirmed.

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**Fig. 4:** 13 years-old girl with recurrent torticollis, headache and vomiting. MRI: sagittal T1 (A), axial T2 (B) and coronal T1 after gadolinium injection (C). Tumor in the posterior fossa, centered in the right cerebellar hemisphere, with a cystic and a mural solid component. The solid nodule shows an intense enhancement after administration of intravenous contrast. Histological diagnosis of hemangioblastoma.

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**Fig. 5:** 8 years-old boy with torticollis of 1 week of evolution, resistant to NSAID treatment. MRI: A) Axial T2, B and C) Sagittal T1 and T2. Morphological and signal abnormality on T1 and T2 in the vertebral body of C4, with an area of low signal corresponding to calcification and sclerosis. Compatible with osteoid osteoma.
Fig. 6: 5 years-old boy with torticollis of 2 months of evolution, recurrent. MRI sagittal T2 (A and B) and coronal (C): Congenital fusion of C5 and C6 (red arrow), with biconcave morphology of the anterior aspect of the block (B). The fusion is complete on the right side, with fusion of the right articular processes (orange arrow). Klippel-Feil syndrome.

Fig. 7: 6 years-old boy with torticollis, mutism, left facial paralysis and drowsiness, who suffered from otitis 5 days ago. MRI DP sequence: Diffuse signal abnormality in cortical areas of frontal lobes, insula and basal ganglia, with limited subcortical white matter involvement. Compatible with disseminated acute encephalitis. There was a good evolution after treatment. A control MRI was performed one year after, with no pathological findings.
Fig. 8: 17 months-old girl with torticollis of 2 weeks of evolution, progressive and refractory to treatment. MRI sagittal T2 (A and B) and T1 after gadolinium injection (C). Arthritis of the right unciform apophysis C3-C4 (red arrow) with a retropharyngeal abscess and an epidural mass (orange arrow). Compatible with spondylodiscitis. There was a good evolution after antibiotic treatment.

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Fig. 9: 7 years-old boy with subacute torticollis and fever. MRI axial T2 (A), diffusion-weighted sequence (B) and axial T1 after gadolinium injection (C). Soft tissue mass extending into the right retropharyngeal space (yellow arrow), hyperintense in T2, with intense restriction in the diffusion-weighted sequences and peripheral enhancement after contrast administration. It creates a moderate mass effect on the posterior wall of
the pharynx (red arrow). Diagnosis of retropharyngeal abscess. Surgical drainage was performed, with good recovery.

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**Fig. 10:** 6 years-old boy with recurrent torticollis of 3 months of evolution. MR sagittal T1 STIR (A) and T2 (B and C). Simple cervical X-ray AP (D) and lateral (E). Area of very low signal in all sequences in the intervertebral disc C3-C4 (yellow arrow). It has a slight paracentral protrusion (red arrow) that does not contact with the medullar cord. There is also a correction of physiological cervical lordosis. The findings correlate with the calcification of the C3-C4 intervertebral disc observed on the plain x-ray (blue arrows).

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Conclusion

MRI is a useful diagnostic test in the evaluation of craniocervical pathology in pediatric patients with torticollis.

Appropriate clinical protocols improve MRI performance in the etiologic diagnosis of torticollis.

Our study shows the validity of the management protocol applied in our center, with a high percentage of pathological findings in those patients selected for MRI.
References


