Whiplash injuries can be visible by functional magnetic resonance imaging

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FROM ABSTRACT:

Whiplash trauma can result in injuries that are difficult to diagnose.

Diagnosis is particularly difficult in injuries to the upper cervical segments of the cervical spine (craniocervical joint (CCJ)) complex.

Studies indicate that injuries in that region may be responsible for the cervicoencephalic syndrome, as evidenced by headache, balance problems, vertigo, dizziness, eye problems, tinnitus, poor concentration, sensitivity to light and pronounced fatigue.

Consequently, diagnosis of lesions in the CCJ region is important.

Functional magnetic resonance imaging is a radiological technique that can visualize injuries of the ligaments and the joint capsules, and accompanying pathological movement patterns.

Three severely injured patients that had been extensively examined without any findings of structural lesions were diagnosed by functional magnetic resonance imaging to have injuries in the CCJ region. These injuries were confirmed at surgery, and after surgical stabilization the medical condition was highly improved.

It is important to draw attention to the urgent need to diagnose lesions and dysfunctions in the CCJ complex and also improve diagnostic methods.

THIS AUTHOR ALSO NOTES:

“Injuries from whiplash trauma are difficult to identify objectively.”

X-rays usually cannot reveal minor injuries, and therefore “reports of pathoanatomical injuries are underestimated.”

“The problem is compounded by the paradox that major injury can result in minor symptoms whereas minor trauma can result in severe, disabling symptoms.”

The alar ligaments stabilize the upper cervical joints, and injuries to those ligaments leads to “considerable hypermobility of the segments.”
There are two different groups of cervical whiplash injuries:

1) Cervicoencephalic Syndrome:
   Headaches, balance problems, disturbed accommodation, poor concentration, sensitivity to light, pronounced fatigue.

2) Lower Cervical Syndrome
   Neck pain, arm pain.

   Injuries to the upper cervical joints are probably responsible for the cervicoencephalic syndrome.

   "Radiologist do not pay special attention" to the upper cervical spine when they receive referrals for whiplash-injured patients. [Important]

   There is a "strong correlation between injuries of the CCJ complex and symptoms such as headaches, concentration disturbances, vertigo, visual problems, tinnitus and balance disturbances." [Important]

   "A functional MRI examination is performed by positioning the cervical spine in approximately 40 different positions such that the pathological movement patterns and injuries to the ligaments and the joint capsules can be detected.” Injuries to these structures cannot be demonstrated in any other imaging method. [Important]

   The following case studies document serious injuries to joint capsules caused by whiplash trauma that were missed with standard diagnostic protocols but documented with functional MRI examinations of the upper cervical spine.

   CASE #1:
   27-year old female
   Struck from right side
   Initial neck pain with right arm weakness and numbness
   Normal initial CT scan
   Soon developed headaches, sensitivity to light and noise
   Problems reading
   Tinnitus
   Tongue numbness
   Diagnosed with psychogenic symptoms

   Several years later Functional MRI revealed:
   Scar tissue around the odontoid which contacted the spinal cord with neck rotation.
   Widespread injuries with scar tissue on the C1/C2 joint capsules.
   Pronounced instability Occiput/C1.
   Bilateral alar ligament injury and scar development.

   At surgery Functional MRI findings were confirmed.
Patient underwent an upper cervical surgical stabilization.

Most of the patient’s symptoms resolved following surgical stabilization.

CASE #2:
38-year old male hit a rail at speed of 56 mph, sustaining a flexion injury.
Symptoms include:
- Neck pain
- Head pain
- Eye problems causing inability to read
- Dizziness
- Balance problems
- Pain behind left eye
- Chewing problems
- Tinnitus
- Numbness on right side of tongue

X-rays were non-revealing.

15 years after injury and on disability, a functional MRI was performed, revealing:
- Scar tissue around the dens which contacted the spinal cord on rotation
- Injury and scar of the atlanto-axial joints
- Alar ligament injury and scar tissue

At surgery Functional MRI findings were confirmed.
Patient underwent an upper cervical surgical stabilization.

Most of the patient’s symptoms resolved following surgical stabilization, and “he summarized his recovery by saying that he got his life back.”

CASE #3:
32-year old female was rear-ended at very high speed while her head was maximally rotated to the right.
Symptoms include:
- Neck pain
- Radiating right arm pain and weakness
- Bursting headaches
- Nausea with severe dizziness
- Eye problems causing blurred vision and inability to read
- Balance problems
- Decreased ability to move left leg
- Occasional losses of consciousness

University hospital evaluations were non-revealing and she was diagnosed as psychosomatic.
2 years after injury a functional MRI was performed, revealing:
Scar tissue around the dens which contacted the spinal cord on rotation
Scar tissue to the joint capsules occiput/C1 and C1/C2
Severe injuries to the alar ligaments with scar tissue

At surgery Functional MRI findings were confirmed.
Patient underwent an upper cervical surgical stabilization.

“Immediately after the operation her headaches vanished, the vision problems improved, and she had no cramps or periods of unconsciousness.”

DISCUSSION

The lesions found in both functional MRI and during surgery in the above cases can only be caused by trauma.

These cases show that severe whiplash injuries can exist in the upper cervical region without being diagnosed by the medical system.

“Under these conditions, severely injured patients can be deemed to be mentally disturbed, denied compensation and offended.”

Functional MRI is an appropriate diagnostic tool in these cases, and it takes about 4 hours to perform.

Functional MRI of the upper cervical spine is especially appropriate when the patients has symptoms of headache, difficulty reading, numbness of the tongue, and neurological features of the upper and lower limbs, all of which are consistent with injury and instability of the C1/C2 segments.

“Following text during reading requires cervical pursuit movements, which require a structurally and physiologically intact C1/C2 segment.”

“Numbness of the tongue is caused by subluxation of the lateral atlantoaxial joint.”

“Neurological disturbances in the upper and lower limbs imply spinal cord compromise.”

“If [upper cervical] injuries are not apparent on conventional imaging, they could be rendered evident by functional MRI.”
KEY POINTS FROM DAN MURPHY

1) Whiplash trauma can result in injuries that cannot be diagnosed with traditional imaging.

2) Diagnosis of whiplash injury is particularly difficult in injuries to the upper cervical segments of the cervical spine.

3) Whiplash injuries in the upper cervical region cause the cervicoencephalic syndrome, which includes headache, balance problems, vertigo, dizziness, eye problems, disturbed accommodation, tinnitus, poor concentration, sensitivity to light, tongue numbness and pronounced fatigue.

4) Functional magnetic resonance imaging is a radiological technique that can visualize injuries of the ligaments and the joint capsules, and accompanying pathological movement patterns.

5) Functional magnetic resonance imaging can diagnose injuries to the upper cervical spine that cannot be diagnosed with any other imaging modality.

6) X-rays usually cannot reveal minor whiplash injuries, and therefore “reports of pathoanatomical injuries are underestimated.”

7) “Major [whiplash] injury can result in minor symptoms whereas minor trauma can result in severe, disabling symptoms.”

8) The alar ligaments stabilize the upper cervical joints, and injuries to those ligaments leads to “considerable hypermobility of the segments.”

9) “Radiologist do not pay special attention” to the upper cervical spine when they receive referrals for whiplash-injured patients. [Important]

10) There is a “strong correlation between injuries of the cranial-cervical joint complex and symptoms such as headaches, concentration disturbances, vertigo, visual problems, tinnitus and balance disturbances.” [Important]

11) “A functional MRI examination is performed by positioning the cervical spine in approximately 40 different positions such that the pathological movement patterns and injuries to the ligaments and the joint capsules can be detected.” Injuries to these structures cannot be demonstrated in any other imaging method. [Important]

12) Severe whiplash injuries can exist in the upper cervical region without being diagnosed by the medical system.

13) “Under these conditions, severely injured patients can be deemed to be mentally disturbed, denied compensation and offended.”
14) Functional MRI of the upper cervical spine is especially appropriate when the patients has symptoms of headache, difficulty reading, numbness of the tongue, and neurological features of the upper and lower limbs, all of which are consistent with injury and instability of the C1/C2 segments.

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17) “Neurological disturbances in the upper and lower limbs imply spinal cord compromise.”

18) “If [upper cervical] injuries are not apparent on conventional imaging, they could be rendered evident by functional MRI.”