

A Magnetic Resonance Image Description Language for
Neuroradiology

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A Magnetic Resonance Image Description Language for Neuroradiology

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1. Introduction

The MEDiate project is a collaborative venture the initial aim of which (the MR Tutor) is to provide a computer-based training system to help neuroradiology trainees develop the skills required to become experts in the field. In particular, the tutor is designed to:

1. Teach trainees a structured Magnetic Resonance (MR) Image Description

This paper describes the full Image Description Language (as of 9/01/2002). Note that for the purposes of the prototype description training system (the MR Tutor) a simplified version

not differ in polarity on the same sequence (otherwise they are of different types).

- Lesions containing two or more distinct parts should be considered as being of the same type.

3. MR Image Description Language - Overview

3.1 Description without Contrast Medium

FOR EACH CASE

RECORD scanner id, patient id, scan date, user,
no of sequences, sequence/echo details,
discrete lesions,
no of types of lesion

FOR EACH TYPE (If Multiple Lesions)

RECORD no of lesions, size ratio, (dispersion)

SELECT LARGEST LESION
(If only one discrete lesion describe this lesion)

FOR EACH SEQUENCE/ECHO

RECORD lesion visibility, (position), (appearance)

FOR EACH LESION DESCRIBED

RECORD (correspondence)

FOR EACH CASE

RECORD (atrophy), (other signs), (other abnormal signals)

Note : () is used to indicate that a list of items is recorded

3.2 Post-Contrast Description

FOR EACH CASE FOR WHICH THERE IS A PRE-CONTRAST SCAN

RECORD scanner id, patient id, scan date, user,
no of post-contrast sequences,
post-contrast sequence details,
no of types of lesion on pre-contrast)

FOR EACH TYPE VISIBLE PRE-CONTRAST

CONSIDER LARGEST LESION DESCRIBED PRE-CONTRAST

FOR EACH POST-CONTRAST SEQUENCE/ECHO

RECORD lesion visibility post-contrast,
(position post-contrast),
(appearance post-contrast)

(additional lesions of
similar post-contrast appearance)

FOR EACH POST-CONTRAST SEQUENCE/ECHO

RECORD other additional lesions visible post-contrast,
(appearance post-contrast)

FOR EACH CASE

RECORD (post-contrast other signs)

4. MR Image Description Language – Full Specification

4.1 Description without Contrast Medium

FOR EACH CASE

Scanner ID

Alphanumeric

Patient ID

Alphanumeric

Scan date

Date

User ID

Alphanumeric

Number of sequences

Number

Sequence /Echo Details

List may be specific to imaging centre

Discrete Lesions

No discrete area of abnormal signals

Single discrete area of abnormal signals

Multiple discrete areas of abnormal signals

If Multiple
then specify Number of types of lesion

Number of Types of Lesion

Numeric

FOR EACH TYPE

Number of Lesions

Number

Size Ratio

> 8 : 1

Approx. 4 : 1

Approx. 2 : 1

Approx. 1 : 1

Dispersion (indicate all that apply for the particular type being described)

Cortical grey matter

Cerebral white matter

Juxta ventricular

Central grey nuclei

Intraventricular

Brain stem / Cerebellum

Pituitary fossa

Basal cisterns

Cortical subarachnoid space

Extracerebral

Skull or Neck

Orbits

Corpus callosum

SELECT LARGEST LESION

FOR EACH SEQUENCE/ECHO

Lesion Visibility (on sequence/echo)

Lesion visible

Lesion invisible

Lesion unavailable

If lesion visible

then describe position, appearance

else go to next sequence/echo

Position = region, major positions, exact locations

Region (select one only)

Left side

Right side

Bilateral

Bilateral & symmetric

Midline

Midline and left

Midline and right

Major Positions and Exact Locations (specify all that apply)

Major Position: Cortical grey matter

Exact locations: : frontal
: parietal
: temporal
: occipital

Major Position: : Cerebral white matter

Exact Locations: : central frontal
: central parietal
: central temporal
: central occipital
: peripheral frontal
: peripheral parietal
: peripheral temporal
: peripheral occipital
: internal capsule

Major Position: : Juxta ventricular
Exact Locations: : frontal
: body
: trigone
: temporal
: occipital

Major Position: : Central grey nuclei
Exact Locations: : caudate nucleus
: thalamus
: lentiform nucleus
: globus pallidus
: putamen

Major Position: : Intraventricular
Exact Locations: : lateral ventricles: frontal
: body
: trigone
: temporal
: occipital
: third ventricle
: fourth ventricle

Major Position: : Brain stem / Cerebellum
Exact Locations: : midbrain
: pons
: medulla
: cerebellar hemisphere : above fastigium
: at fastigium
: below fastigium
: cerebellar vermis : above fastigium
: at fastigium
: below fastigium

Major Position: : Pituitary fossa
Exact Locations: : intrasellar
: suprasellar
: parasellar

Major Position: : Basal cisterns
Exact Locations: : chiasmatic
: interpenduncular
: pontine
: medullary
: ambient
: quadrigeminal

: cerebellopontine angle
: cisterna magna
: crural

Major Position: : Cortical subarachnoid space
Exact Locations: : cerebral sulci space alone
: cerebral cortical subarachnoid space over gyri
: insula
: pericerebellar space

Major Position: : Extracerebral
Exact Locations: : frontal
: parietal
: temporal
: occipital
: scalp

Major Position: : Skull or Neck
Exact Locations: : skull vault : outer table
: : middle table
: : inner table
: : frontal
: : parietal
: : temporal
: : occipital
: skull base : foramina
: neck

Major Position: : Orbits
Exact Locations: : globe
: retro-orbital fat
: extrinsic eye muscle
: optic nerve

Major Position: : Corpus callosum
Exact Locations: : genu
: body
: splenium

Appearance = margin, internal pattern, lesion OR parts description

Margin

Mainly sharp
Graded

Outward facing profile naked (Yes/No)

Internal Pattern (overall)

Homogeneous
Lesion comprises single part with focal structure
Lesion composed of two distinct parts
Lesion composed of three distinct parts
Unstructured heterogeneous

If homogeneous,
single part with focal structure or
heterogeneous
then describe lesion

If two distinct parts
three distinct parts
then describe each part including internal pattern of part

**Lesion Description = Shape, Area, No of slices, Abnormal blood vessels,
Interior pattern of focal structure **, Intensities**

**Part Description = Shape, Area, No of slices, Abnormal blood vessels,
Part structure, Interior pattern of focal structure*,
Intensities**

** if appropriate

Shape (select single most appropriate)

Rounded

Oval

Linear

Irregular rounded

Irregular

Conforms to an anatomical feature

If Shape is Rounded
 Oval
 Linear
 Irregular rounded
 Irregular

then specify Area and No of Slices

If Shape is Conforms to an anatomical feature
then specify Anatomical Feature and Proportion Occupied
 (Area and No of slices not appropriate)

Area

sq.cms

No of Slices

slice(s)

Conforms to Anatomical Feature : Feature List

Periventricular margin

Optic tract

Pyramidal tract

Quadrigeminal plate

Optic chiasm

Optic nerve

5th nerve

8th nerve

9th nerve

12th nerve

Extradural space

Subdural space

Basi-sphenoid

Basi-occiput

Petrous bone

Proportion Occupied

Whole

Approx. half

Less than a quarter

Abnormal blood vessels

No abnormal blood vessels present

Abnormal blood vessels present

Part Structure :

Homogeneous

Containing distinct focal structure

Unstructured heterogeneous

If Lesion or Part contains Focal Structure

then describe Focal Structure

and specify Intensity(s) of both Focal Structure and Remainder

Interior Pattern of Focal Structure :

Homogeneous focal structure

Unstructured heterogeneous focal structure

Multiple repetitive focal structure

Concentric layers: single focal structure

Concentric layers: single elements of mult.repetitive focal structure

Concentric layers: mult.repetitive centre

Intensity

Reference :

cerebral white matter
cerebellar white matter

If homogeneous lesion/part/focal structure
then specify single intensity

If heterogeneous lesion/part/focal structure
then specify all relevant intensities

Intensities

Specify on the scale :

+++

++

+

Isointense

-

--

FOR EACH TYPE

Correspondence

(Recorded when part of a lesion is also seen image obtained from a different sequence/echo or orientation)

No correspondence

Correspondence in appearance

Correspondence not relevant

If Correspondence in appearance

then specify sequences and relevant correspondence

Sequences

User input

Correspondence in Appearance :

Lesion with Lesion

Lesion with Part

Lesion with Focal Structure

Part with Lesion

Part with Part

Part with Focal Structure

Focal Structure with Lesion

Focal Structure with Part

Focal Structure with Focal Structure

FOR EACH CASE

Atrophy

Expansion of the cortical sulci :

Zero quadrants
One quadrant
Two quadrants
Three quadrants
Four quadrants
Unrecordable

Dilatation of the lateral ventricles :

None
Moderate
Marked
Unrecordable

Dilatation of pontine and CP cisterns :

None
Moderate
Marked
Unrecordable

Expansion of Sylvian fissure :

None
Moderate
Marked
Unrecordable

Overall Atrophy Score : Calculated from above

Other Signs (each Present, Absent or Unrecordable)

Mass effect
Expansion of fourth ventricle
Expansion of basal cisterns
Dilatation of third and both lateral ventricles
Localised loss of brain substance
Dilatation of Virchoff-Robin spaces

Other Abnormal Signals_(not already described as a lesion)

Diffuse areas

Discrete areas

No further abnormal signals

If Diffuse areas or
 Discrete areas
then specify Location of areas

Location of Areas of Abnormal Signal (specify all)

Cortical grey matter

: frontal
: parietal
: temporal
: occipital

Cerebral white matter

: central frontal
: central parietal
: central temporal
: central occipital
: peripheral frontal
: peripheral parietal
: peripheral temporal
: peripheral occipital
: internal capsule

Brain stem / Cerebellum

: midbrain
: pons
: medulla
: cerebellar hemisphere. : above fastigium
: at fastigium
: below fastigium
: cerebellar vermis : above fastigium
: at fastigium
: below fastigium

4.2 Post Contrast Image Description

FOR EACH CASE

Scanner ID

Alphanumeric

Patient ID

Alphanumeric

Post-Contrast Scan date

Date

User ID

Alphanumeric

Number of post-contrast sequences

Number

Post-contrast Sequence /Echo Details

List may be specific to imaging centre

FOR EACH TYPE VISIBLE PRE-CONTRAST

CONSIDER LARGEST LESION VISIBLE PRE-CONTRAST

FOR EACH POST-CONTRAST SEQUENCE/ECHO

Lesion Visibility Post-Contrast

Lesion visible

Lesion not visible

Position Post-Contrast

As described Pre-Contrast ? (Yes, No)

If No

then specify Position using Major Positions and Exact Locations

Appearance Post-Contrast

If pre-contrast structure NOT comprising parts

then describe effect of enhancement on lesion

If pre-contrast structure comprises two or more distinct parts

then describe effect of enhancement on each part

Effect of Enhancement on Appearance of Lesion/Part

Throughout lesion/part

Focal structure only

Focal structure appeared

All except focal structure

Ring enhancement

Extends beyond lesion/part edge

Of pathological blood vessels

Did not enhance

Other than patterns described above

Enhancement reflects pre-gadolinium morphology ? (Yes/No)

CONSIDER OTHER LESIONS OF SAME TYPE PRE-CONTRAST

Other Lesions of same type - Enhancement

All enhanced
Some enhanced
None enhanced

If All or Some Enhanced
then specify Effect of Enhancement on Appearance

Effect of Enhancement on Appearance of (Majority of) Lesions of Same Type

Throughout lesion
Focal structure only
Focal structure appeared
All except focal structure
Ring enhancement
Extends beyond lesion edge
Of pathological blood vessels
Other than patterns described above

Additional lesions of similar post-contrast appearance

Additional lesions appeared of similar post-contrast appearance ? (Yes/No)

FOR EACH POST-CONTRAST SEQUENCE/ECHO

Other additional lesions visible post-contrast

Other lesions appeared not resembling
post-contrast appearance of any type above ? (Yes/No)

If Yes
then specify Appearance Post-Contrast

Appearance Post-Contrast

Throughout lesion
Focal structure only
Focal structure appeared
All except focal structure
Ring enhancement
Extends beyond lesion edge
Of pathological blood vessels
Other than patterns described above

Post-contrast other signs

Meningeal enhancement
Widespread enhancement

