

Spinal DCS: a case report

Dominique Buteau, MD

Medical Director

Quebec Diving Medical Center

Hôtel-Dieu de Lévis

On a Sunday night...

- Recreational diver
- 55 years old
- More than 500 dives
- Returning from a liveaboard in the Carribean

Dive profile

- 2 or 3 dives per day during the week
- Surface intervals regulary less than 1 hour
- Air diving

Dive profiles of the last 2 days

| Date | Start Dive | Max Depth | Average Depth | TBT | Surface Interval |
|-------|------------|-----------|---------------|--------|------------------|
| 01/17 | 10h14 | 95 ft | 63 ft | 33 min | 52 min |
| 01/17 | 11h39 | 62 ft | 42 ft | 42 min | |
| 01/18 | 11h01 | 78 ft | 34 ft | 41 min | 45 min |
| 01/18 | 12h29 | 62 ft | 40 ft | 43 min | |

The symptoms

- After the dives on 01/18:
 - Had « few » alcoholic drinks during the week and more after the last dive of the week
 - Hot tub



The symptoms

- Woke up on 01/19:
 - Paresthesia under the umbilic and in the 2 legs
 - No weakness
- Took the plane on 01/20:
 - No aggravation of symptoms

Symptoms

- Paresthesia still present
- On 01/21, when doing a bowel movement, he notices that he did not feel the stool passing through his anus
- So he decides to call the Quebec diving emergency hotline at 22h00 that Sunday evening...

Medical evaluation

- 55 years old
- Smoker: 4-5 cigarettes/day
- Past medical conditions:
 - Cholecystectomy
 - Pancreatitis

Physical examination

- Abdominal obesity
 - Approx. 120 kgs
- BP: 176/100, Pulse: 84
- Cardiac auscultation:
Normal
- Pulmonary auscultation:
Normal



Neurological exam

- Walking OK, no ataxia
- Cranial nerves OK
- Sensitivity:
 - Normal in both arms
 - Complete anesthesia on a large area under the umbilicus
 - Hypoesthesia by pricking and light touch beginning under the umbilicus and extending to the thighs (anterior surface)
 - Vibratory sense absent in both feet
 - Proprioception and cold perception conserved
 - Perianal sensitivity diminished

Neurological exam

- Osteotendinous reflexes absents in both legs
- Muscular strength normal in both the arms and legs
- Anal sphincter tonus is normal

Contributing factors for spinal DCS

- Age
- Obesity
- Questionable physical condition
- Short surface intervals
- Alcohol intake
- Hot tub after the dive

Spinal DCS

- Treatment : Table 6 modified
 - Beginning at 0h59 on 01/22
 - More than 66 h after the first symptoms

Evolution during Tx

- After 2 periods of O2:
 - Diminishing of Paresthesia at the toes
- After 3 periods of O2:
 - Paresthesia still diminishing at the toes
 - So we decided to continue on TT6 modified
- After 4 periods of O2:
 - Diminishing of Paresthesia in the feet and under the umbilicus

Evaluation after first Tx

- Serious improvement of the sensitivity in the feet
- Hypoesthesia in both thighs
- Osteotendinous reflexes seem to improve

Treatments schedule

- Day 1:
 - Table 6 with extensions and then Table 5
- Day 2 through day 9:
 - 2,5 ATA 90 min daily
- Neurologist decides to try Corticosteroids
 - Solumedrol 1 g IV die for 3 days (Day 4 to 6)

Evolution during treatment

| | |
|---|--|
| Day 2 | No further improvement |
| Day 3 | Noticeable improvement |
| Day 4 *solumedrol given before Tx | Paresthesia lessening in both knees, return of left rotulean reflex and achillean reflexes |
| Day 5 | Slight improvement |
| Day 6 to 9 | No further improvement |

Neuro exam at discharge

- Osteotendinous reflexes are present
- Temperature, pricking and slight touch sensitivity are OK in the lower limbs
- Vibratory sense is absent in the right foot and reduced in the left

MRI of the spinal cord (01/24)

- In the medulla, hyperintensities on T2 weighted images and in STIR with a slight augmentation of the anteroposterior diameter of the medulla. Hyperintensities are located from T3-T4 level to T5 level.
- This lesion occupies 3/4 of the superficialia of the medulla. 5,3 mm in AP and 5,5 mm in transverse and 32 mm in cephalocaudal
- Ischemis VS inflammatory ?

Name: 1
ID: NOT DEFINED
DoB:
Date: 2008-01-24
Time: 12:17:14
No.: 10
Pat C:
x 1.40

HL

Inst:
Model:
Organ:
10

A



TT:
TI:
TR: 572.00
TE: 11.00
Matrix: 512/0/0/230
SO: SAT1/FS

FR

CM: GAD 0
SL: 3.93
ST: 3.00
Angle: 180.00
FoV: 100.00
Im C:
W: 01137
C: 00513

Name: 1
ID: NOT DEFINED
DoB:
Date: 2008-01-24
Time: 12:17:14
No.: 10
Pat.C:
x 1.35

HL

Inst:
Model:
Organ:
10

A

TT:
TI:
TR: 572.00
TE: 11.00
Matrix: 512/0/0/230
SO: SAT1/FS

FR

CM: GADO
SL: 3.93
ST: 3.00
Angle: 180.00
FoV: 100.00
ImC:
W: 01137
C: 00513



Name: 1
ID: NOT DEFINED
DoB:
Date: 2008-01-24
Time: 11:28:01
No.: 9
Pat C:
x 1.35

HL

Inst:
Model:
Organ:
9

A



TI:
TI: 140.00
TR: 4330.00
TE: 77.00
Matrix: 256/0/0/230
SO: IR/SAT2

FR

CM:
SL: 0.63
ST: 3.00
Angle: 180.00
FoV: 100.00
ImC:
W: 00488
C: 00197



Name: 1
ID: NOT DEFINED
DoB:
Date: 2008-01-24
Time: 11:28:01
No.: 9
Pat C:
x 1.35

HL

Inst:
Model:
Organ:
9

A



TT:
TI: 140.00
TR: 4330.00
TE: 77.00
Matrix: 256/0/0/230
SO: IR/SAT2

CM:
SL: 0.63
ST: 3.00
Angle: 180.00
FoV: 100.00
ImC:
W: 00488
C: 00197

FR



Name: 1
ID: NOT DEFINED
DoB:
Date: 2008-01-24
Time: 11:35:47
No.: 2
Pat C:
x 1.35

AF

Inst:
Model:
Organ:
2

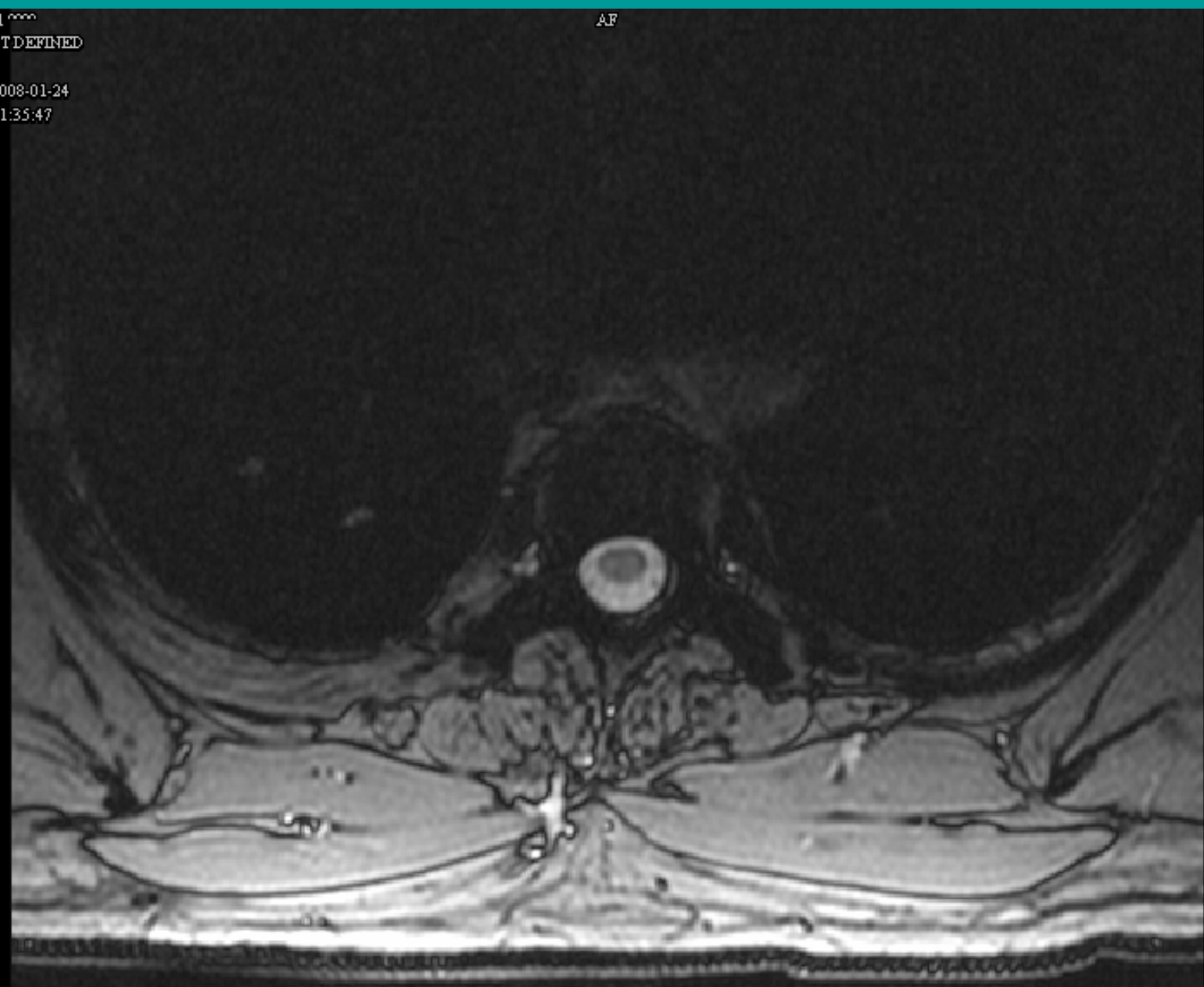
RHA

LFP

TI:
TI:
TR: 809.00
TE: 22.00
Matrix: 256/0/0/192
SO: SAT1

CM:
SL: 44.61
ST: 3.50
Angle: 30.00
FoV: 100.00
ImC:
W: 00876
C: 00377

PH



Name: 1
ID: NOT DEFINED
DoB:
Date: 2008-01-24
Time: 11:35:47
No.: 2
Pat C:
x 1.35

AF

Inst:
Model:
Organ:
2

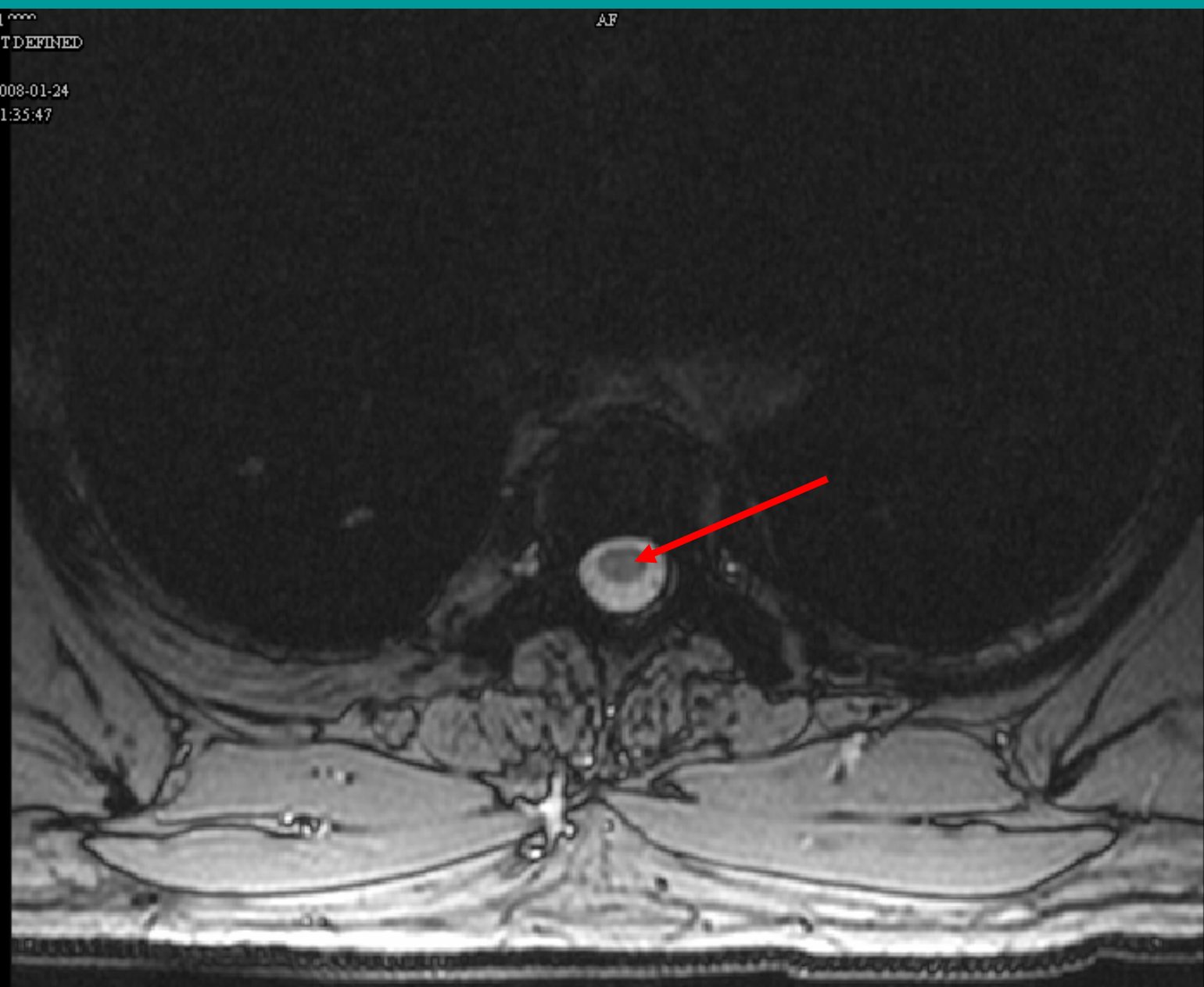
RHA

LFP

TI:
TI:
TR: 809.00
TE: 22.00
Matrix: 256/0/0/192
SO: SAT1

CM:
SL: 44.61
ST: 3.50
Angle: 30.00
FoV: 100.00
ImC:
W: 00876
C: 00377

PH



MRI with diffusion study (01/28)

- Regression of the lesions (18 mm cephalocaudal VS 32 mm on first MRI)
- Diffusion study: hyperintenses signals suggesting ischemia, no hyposignal

Name: 2
ID: NOT DEFINED
DoB:
Date: 2008-01-28
Time: 12:20:14
No.: 7
Pat C:
x 1.60

HLP

Inst:
Model:
Organ:
7

AL

FR

TI:
TI:
TR: 3190.00
TE: 102.00
Matrix: 448/0/0/202
SO: SAT1

CM:
SL: 14.48
ST: 3.00
Angle: 170.00
FoV: 100.00
ImC:
W: 01362
C: 00609

FPA



Name: 2
ID: NOT DEFINED
DoB:
Date: 2008-01-28
Time: 12:20:14
No.: 7
Pat C:
x 1.60

HLP

Inst:
Model:
Organ:
7

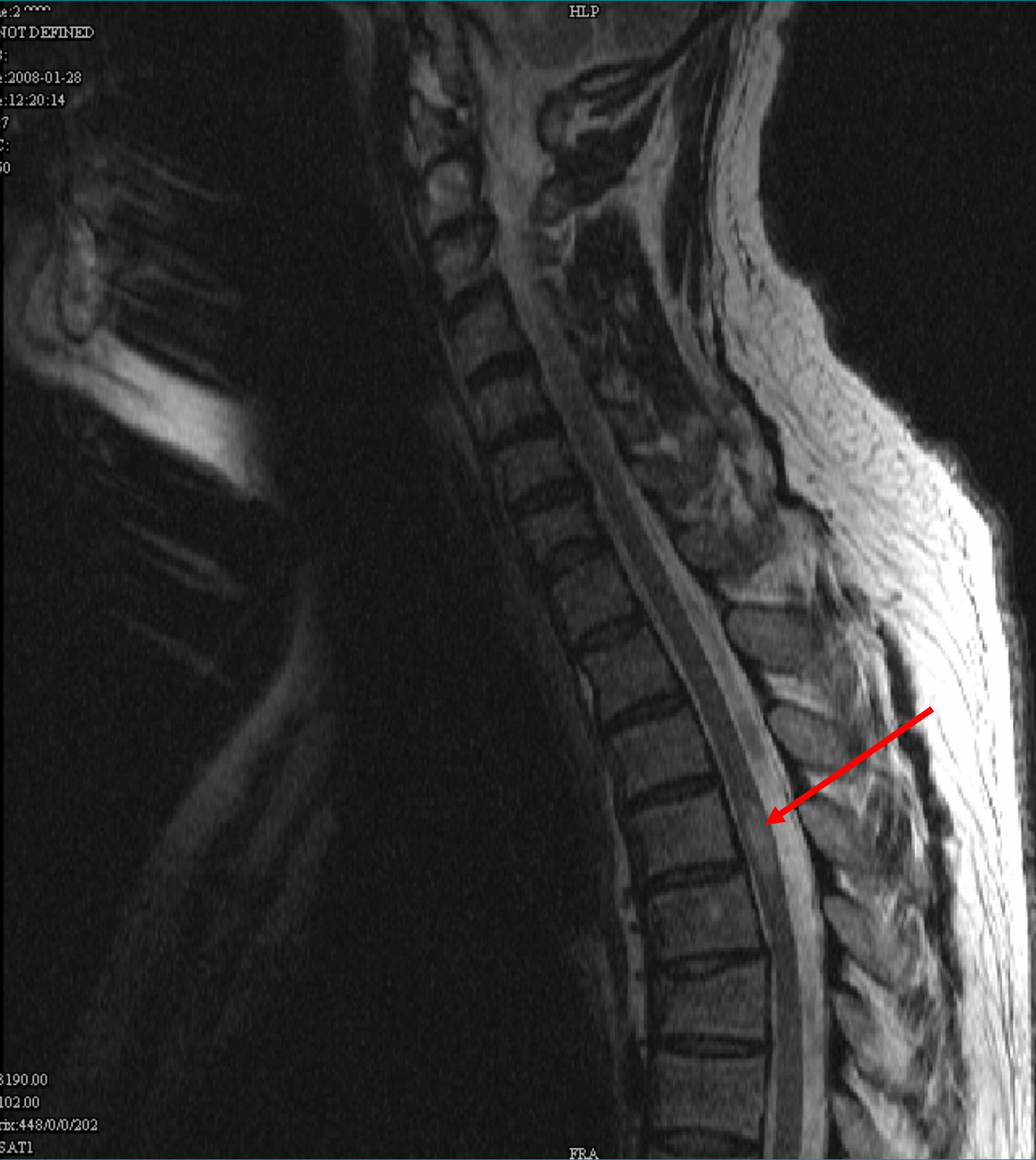
AL

PR

TT:
TI:
TR: 3190.00
TE: 102.00
Matrix: 448/0/0/202
SO: SAT1

CM:
SL: 14.48
ST: 3.00
Angle: 170.00
FoV: 100.00
ImC:
W: 01362
C: 00609

FPA



Follow-up at 3 months

- Diver reports complete resolution of symptoms 2 weeks after the hyperbaric treatments
- A complete Normal neurological exam

Discussion

- Respecting non-deco limits does not completely protect you from DCS
- Even delayed treatment can bring improvement of the condition
- Which initial treatment table is the best ?

Treatment tables for follow-up treatment

- Wilson et al. (1989), retrospective analysis
 - 2,8 ATA vs 2,4 ATA for second tx
 - Lower relapse rate : 10% vs 40 %

Treatment tables for follow-up treatment

- Ball (1993)
 - 2,8 ATA vs 2,4 ATA
 - No difference in outcome

Follow-up treatment tables

- Treatment tables designed for wound healing (2,0-2,5 ATA) also appear to be clinically effective as follow-up treatments for DCI
 - Richard E Moon
- US Navy Diving manual: Tables 5 or 9