

# Spine dysfunctions: What, Where, Why & How – The medical aspect

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# Neck and upper back pain:

## **WHAT** does this really mean in daily life?



# WHAT is the issue to be addressed?



While sitting, office workers, tend to lean forward or to slouch down in the chair. This partial immobilization can cause low back pain or neck pain because static posture increases stress on the back, neck, shoulders, arms and legs.



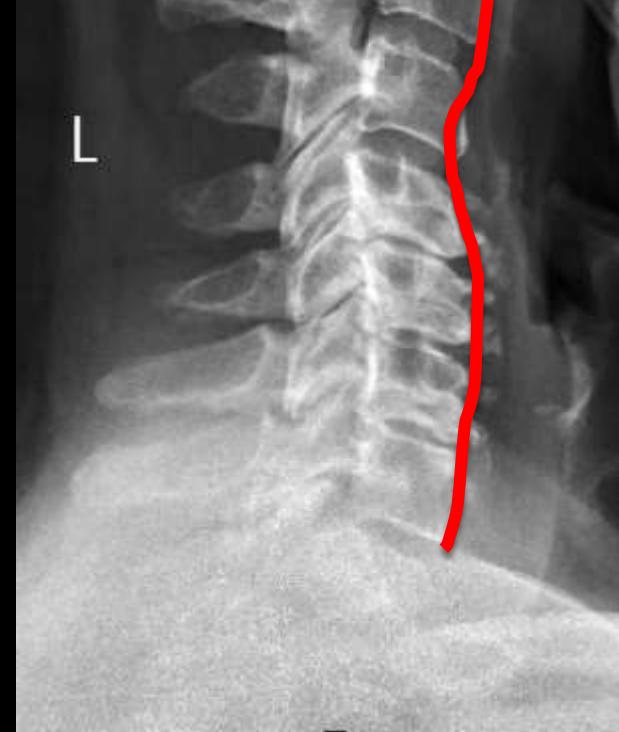
Neck/back pain or upper limb disorders remain the most common occupational diseases in the European Union long-term sickness absence.

- **Germany**: One quarter of the working days lost are due to MSD disorders such as **neck pain with an economic impact** estimated to represent **0,4% in productivity loss** (SUGA, 2006)
- **France**: (National Plan on Health and Safety at Work 2005-2009), neck and back pain led to a loss of 6.5 million workdays and a **cost of 650 million EUR**. The indirect costs have to be added to these direct costs.

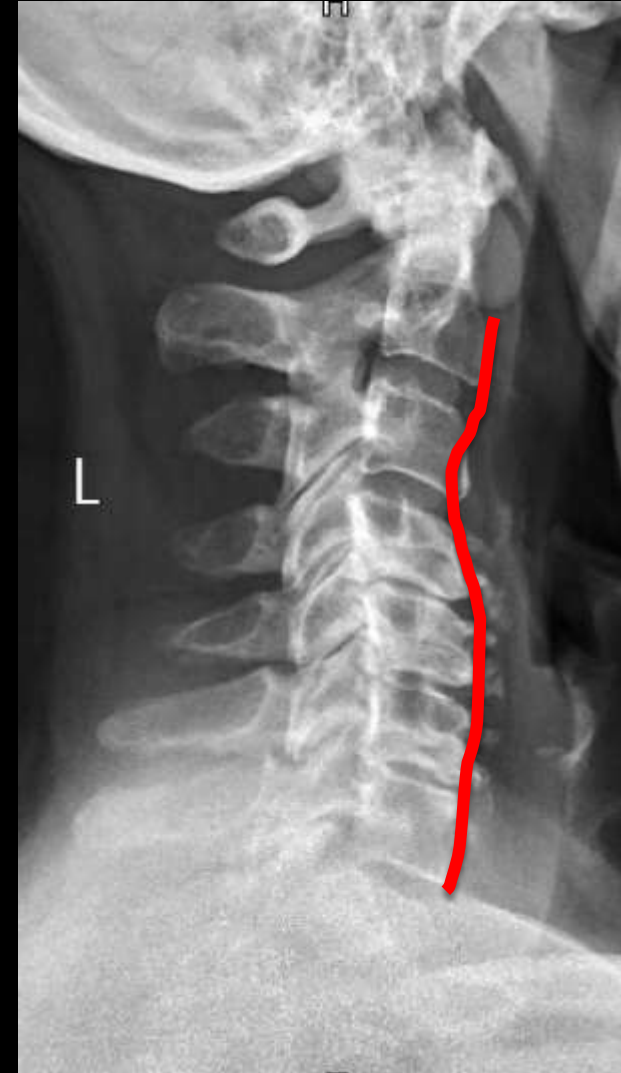
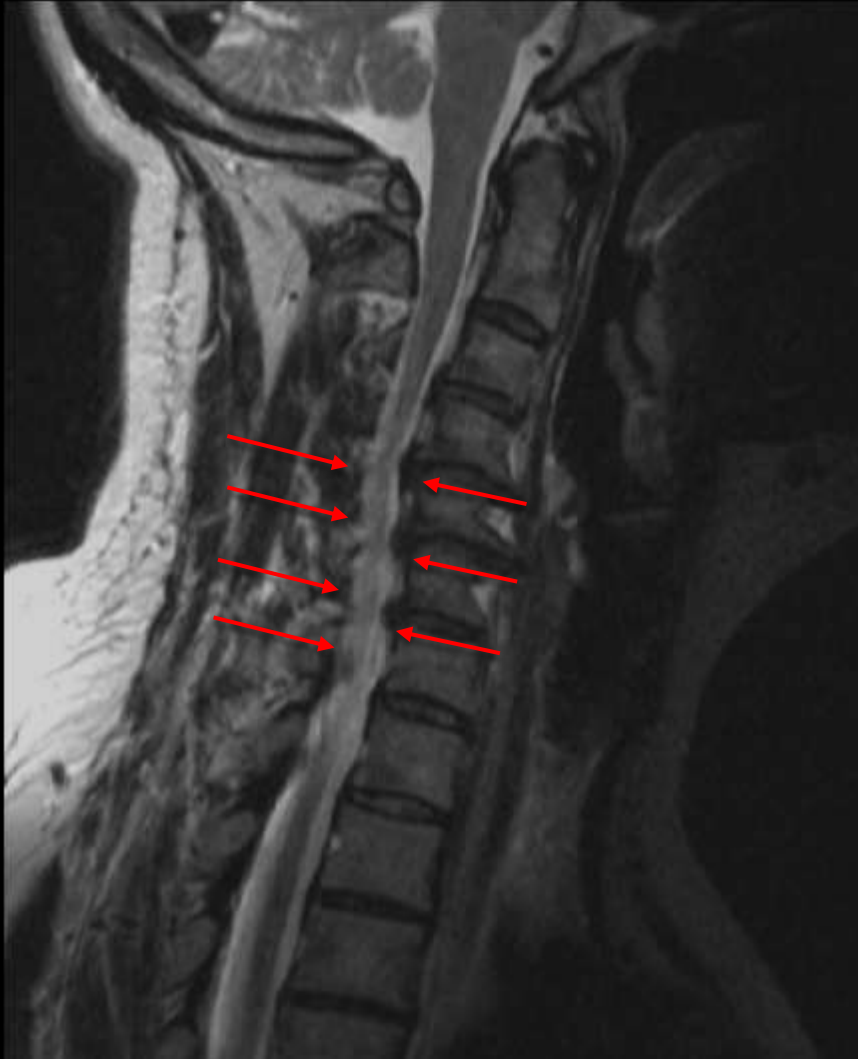
High socioeconomic consequences in terms of health expenses and lost working days



# What can the physician “see” in patients with chronic neck pain?

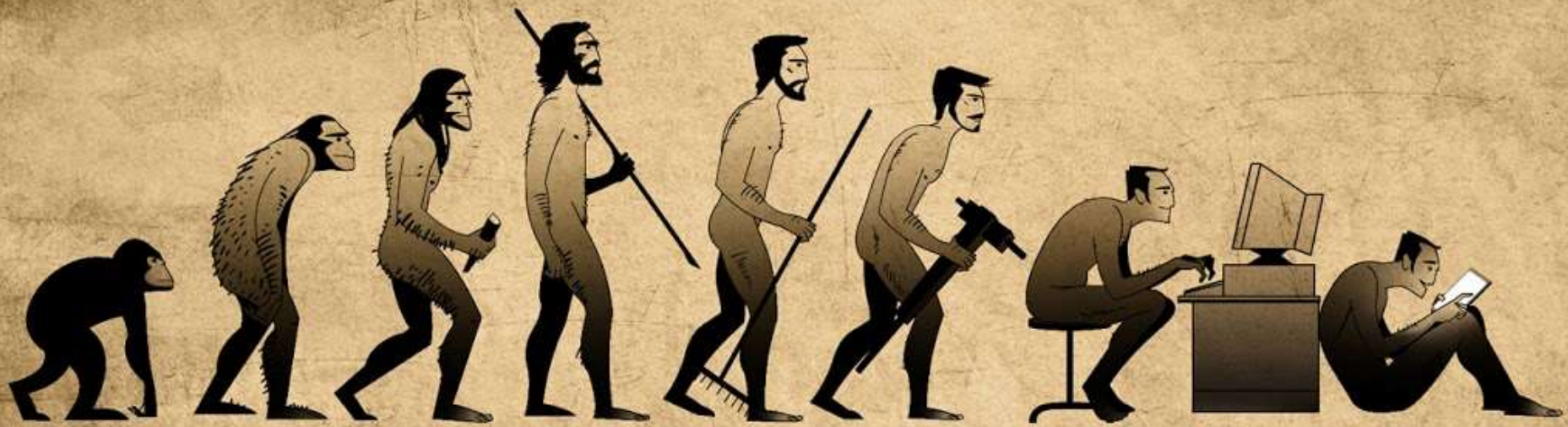


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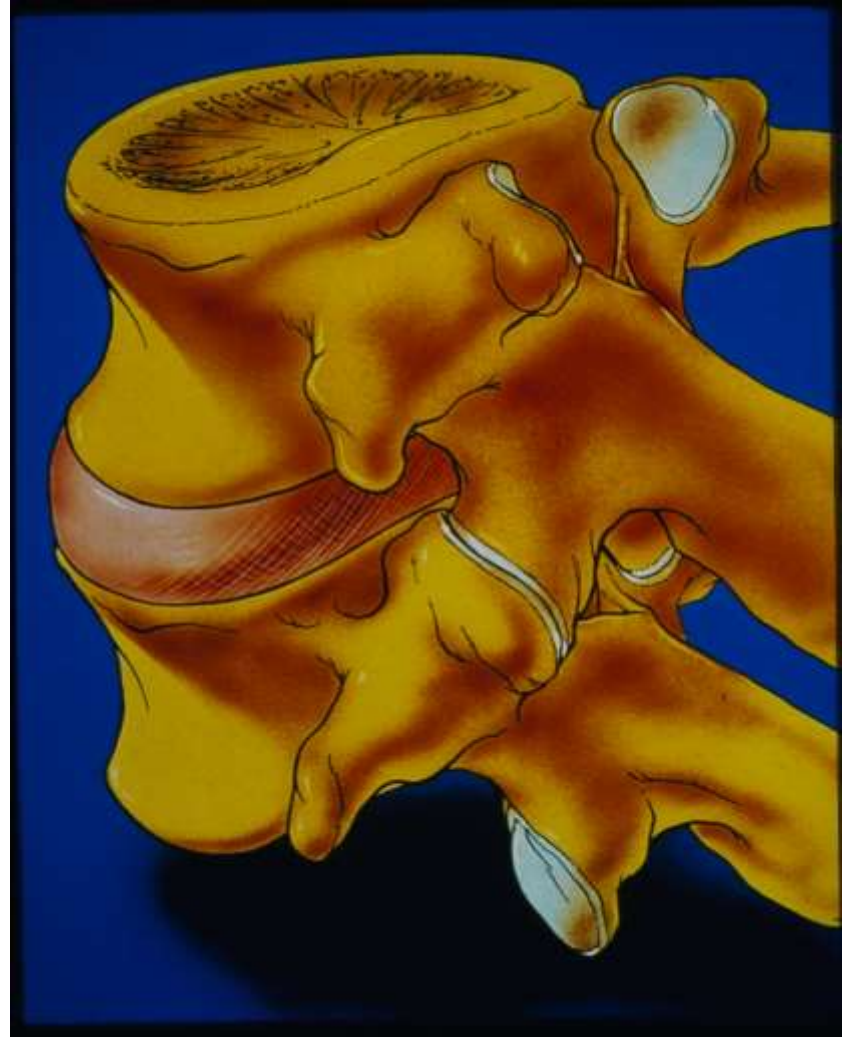


# WHERE?



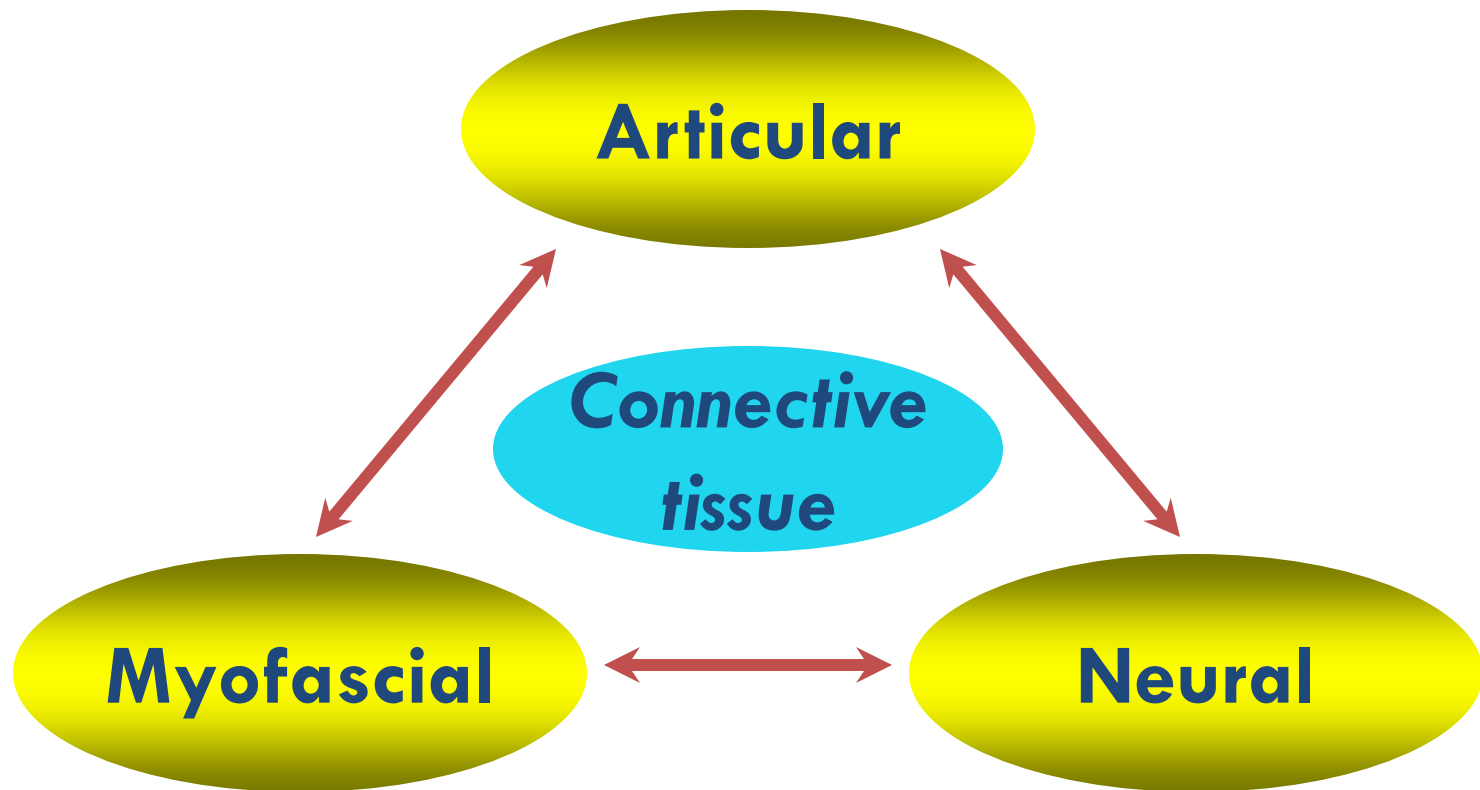
# Motion segment

- vertebral bodies
- intervertebral disc
- facet joint
- spinal canal
- foramina
- transverse process
- spinous process





# Movement System



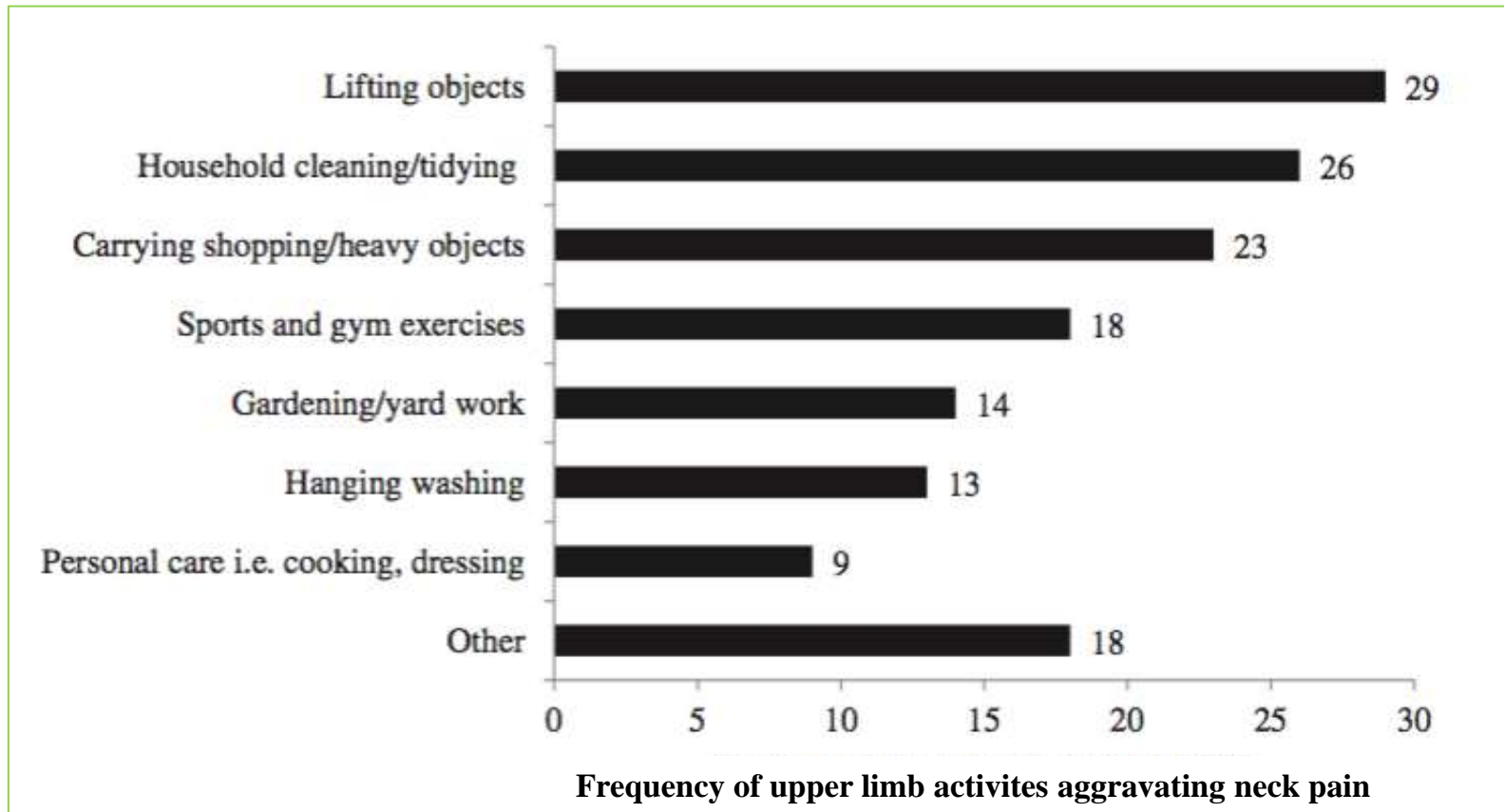
# WHY? Clinical characteristics of pain

Multivariate regression models of characteristics associated with (A) Pain and (B) Disability.

Characteristic	$\beta$	<i>B</i>	95%CI
<b>(A) Pain.</b> Adjusted $R^2 = 32.9\%$			
Neck disability index	0.57	0.15	0.12 to 0.19
Concomitant low back pain	-0.14	-0.57	-1.06 to -0.07
<b>(B) Disability.</b> Adjusted $R^2 = 48.8\%$			
Pain	0.51	1.89	1.48 to 2.29
Self-rated general health	0.25	2.22	1.25 to 3.19
Nausea	0.23	3.98	2.10 to 5.87
Smoker	0.13	3.20	0.45 to 5.94
SF-12 MCS	-0.13	-0.09	-0.17 to -0.01
Duration of neck pain	-0.12	-0.04	-0.08 to -0.00

$\beta$  standardized regression coefficient; *B* regression coefficient; 95%CI confidence interval for *B*.  $R^2$  = The proportion of total variance explained by the model.

# Patients with non-specific neck disorders commonly report upper limb disability



# Are there any prognostic factors for rapid improvement of a new episode of neck pain?

**Table 2.** Multivariate predictors of time to recovery from the episode of neck pain and of level of disability at 3 months.

Predictor	Time to recovery Hazard ratio (95% CI)	Disability at 3 mo <i>B</i> (95% CI)
Smoker <sup>a</sup>	2.04 (1.11 to 3.78)	—
Self-rated general health (1–5) <sup>b</sup>	0.75 (0.58 to 0.98)	—
Duration of symptoms (days) <sup>b</sup>	0.98 (0.97 to 0.99)	—
Headache <sup>a</sup>	0.56 (0.37 to 0.85)	—
Upper back pain <sup>a</sup>	0.54 (0.36 to 0.81)	2.06 (0.22 to 3.90)
Initial NDI score (0–50) <sup>b</sup>	—	0.16 (0.04 to 0.28)
Lower back pain <sup>a</sup>	—	2.58 (0.80 to 4.36)
Past sick leave for neck pain <sup>a</sup>	—	2.84 (0.94 to 4.74)
Age (years) <sup>b</sup>	—	0.11 (0.03 to 0.19)

# Sitting posture:

## Do we know enough about?





**NSCBP: 78,3%**  
**Controls: 78,3%**

**1**



**NSCBP: 19,2%**  
**Controls: 18,3%**



**NSCBP: 14,2%**  
**Controls: 14,9%**



**3**



**4**



**5**



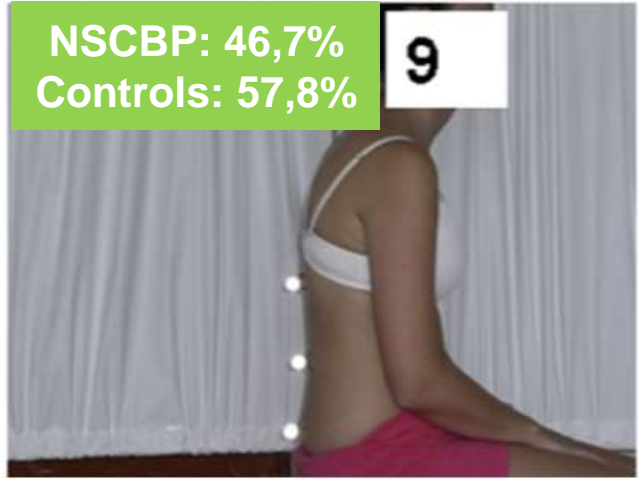
**6**



**7**



**8**



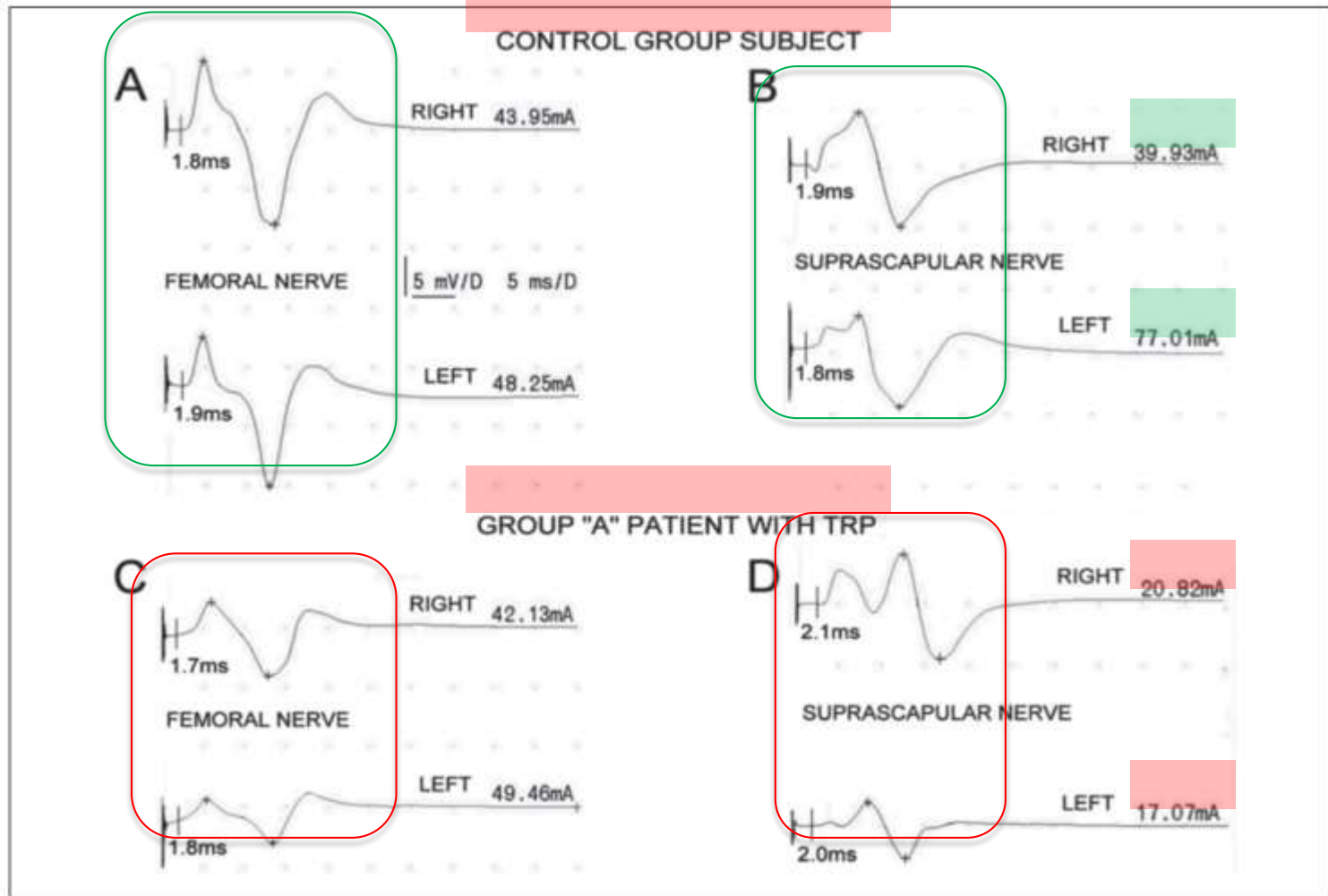
**NSCBP: 46,7%**  
**Controls: 57,8%**

**9**

# WHAT happens when you feel neck and upper back pain? The medical explanation!



# WHAT? Changes in muscle activity in patients with chronic upper spinal pain

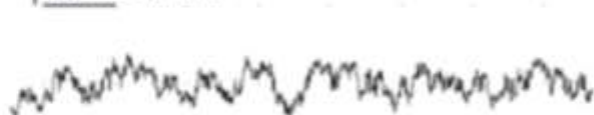




## CONTROL GROUP SUBJECT

### sEMG RECORDING IN RESTING STATE

20uV/D 80ms/D



## GROUP "A" PATIENT WITH TRP

20uV/D 80ms/D



### sEMG RECORDING DURING MAXIMAL CONTRACTION

1000uV/D 80ms/D



1000uV/D 80ms/D



### eEMG RECORDING IN RESTING STATE

100uV/D 80ms/D



100uV/D 80ms/D



# Changes in muscle activity in patients with chronic upper spinal pain

Comparison of pain intensity, occurrence of active trigger points and muscle strength evaluation in normal subjects and patients with myofascial pain syndrome

Test	Control group n=30 (mean±SD)		Group A n=13 (mean±SD)		Group B n=11 (mean±SD)		Group C n=6 (mean±SD)	
VAS scale (0-100)	0.5±0.2		6±1.5*		5.6±2.1*		4.8±1.5*	
Duration of pain	no pain		chronic (constant)		chronic (constant)		transient	
Number of active trigger points in palpation study	Right side 0	Left side 0	Right side 48	Left side 39	Right side 0	Left side 0	Right side 0	Left side 0
Lovett's scale (0-5)	Right side	Left side	Right side	Left side	Right side	Left side	Right side	Left side
Trapezius muscle	4.8±0.5	4.7±0.5	3.5±0.5*	3.6±0.5*	3.6±0.5*	3.5±0.5*	3.2±0.8*	3.5±0.5*
Gluteus medius muscle	4.7±0.4	4.6±0.5	4.1±0.7*	4.2±0.6*	4.1±0.5*	4.2±0.6*	4.0±0.4*	3.8±0.4*
Tensor fasciae latae muscle	4.9±0.6	4.7±0.5	4.2±0.7*	4.2±0.6*	4.1±0.5*	4.1±0.5*	3.8±0.8*	3.8±0.8*
L erector spinae muscles	4.7±0.5		3.9±0.8*		4.0±0.6*		4.0±0.9*	

Asterisks indicate significant differences in parameters found in patients and normal subjects at p=0.05.



# Neck muscle size and strength decrease significantly in chronic neck pain office workers

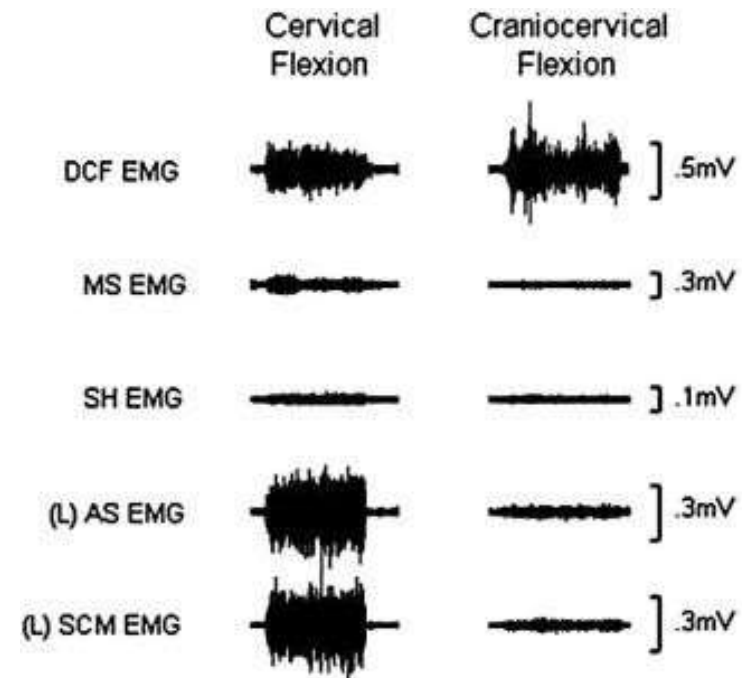
The mean  $\pm$  SD and range of the strength of the neck extensor and flexor muscles, the ratios of neck flexor and extensor strength, the strength of neck flexor muscles to body weight, the strength of neck extensor muscles to body weight, semispinalis capitis muscle size (MLD), the strength of neck extensor muscles to semispinalis capitis muscle size (MLD) and MLD to body weight ( $n = 20$ , 10 controls and 10 patients).

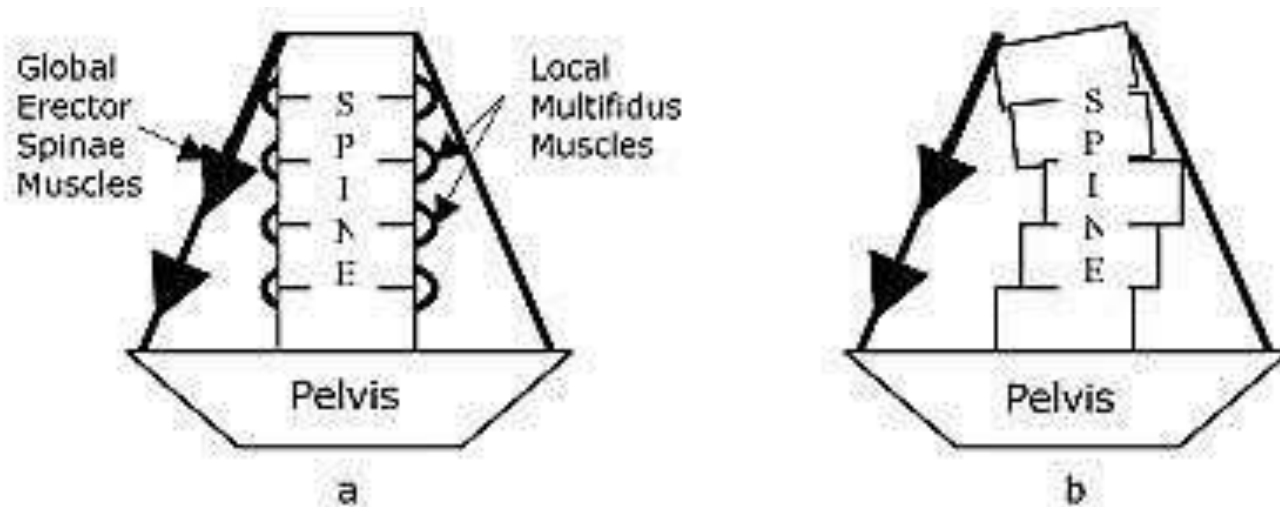
Group	Flex. (N)	Ext (N)	Flex./Ext. (N)	Flex./wt. (N/kg)	Ext./wt (N/kg)	MLD (Cm <sup>2</sup> )	MLD/wt (cm <sup>2</sup> /kg)	Ext./MLD (N/cm <sup>2</sup> )
Controls	62.2 $\pm$ 16.1 35.3–87.3	127.2 $\pm$ 23.2 97.1–157	0.50 $\pm$ 0.15 0.2–0.8	1.1 $\pm$ 0.2 0.7–1.4	2.2 $\pm$ 0.4 1.7–2.9	1.61 $\pm$ 0.19 1.3–2.0	2.80 $\pm$ 0.3 2.5–3.4	79.5 $\pm$ 16.0 65.0–110.6
Patients	46.2 $\pm$ 7.2 37.3–56.9	73.4 $\pm$ 9.8 62.8–93.2	0.63 $\pm$ 0.11 0.4–0.8	0.7 $\pm$ 0.1 0.6–0.9	1.2 $\pm$ 0.2 0.98–1.5	1.36 $\pm$ 0.26 0.84–1.7	2.1 $\pm$ 0.4 1.3–2.5	56.0 $\pm$ 14.9 40.6–90.0

Multiplied Linear Dimensions (MLD), wt. = weight, Ext. = cervical extension strength, Flex. = cervical flexion strength.

*„Neck muscle weakness and atrophy are two common causes of pain and disability among office workers“*

- ❖ Deep neck flexors demonstrate constant activation during flexion irrespective of the movement pattern
- ❖ Superficial muscle (scalene, SCM) show EMG silence during craniocervical flexion (head on neck flexion)





- ❖ Coordinated action of local and global stabilizers is needed
- ❖ If local stabilizers don't initiate contraction the spine will be de-stabilized by global stabilizers and mobilisers

# HOW: Does your GP knows enough about treatment?



# Management of (acute) neck pain in general practice

## What did the GP advise?

Modality	n (%) <sup>a</sup>
No advice given	3 (2)
Advised the patient to wait and see for the natural course	42 (23)
Advised to improve posture and keep moving	41 (22)
Advised the patient to keep rest	33 (18)
Instructed the patient in home exercises	16 (9)
Advised to stop working and report on sick leave	6 (3)
Other advice given	6 (3)
Prescribed medication <sup>b</sup>	78 (42)

<sup>a</sup>Total is more than 100% because the GP could apply several modalities at the same time. <sup>b</sup>More women (48%) received pain medications than men (31%) and women received more muscle relaxants (13%) than men (6%).

N = 187 patients



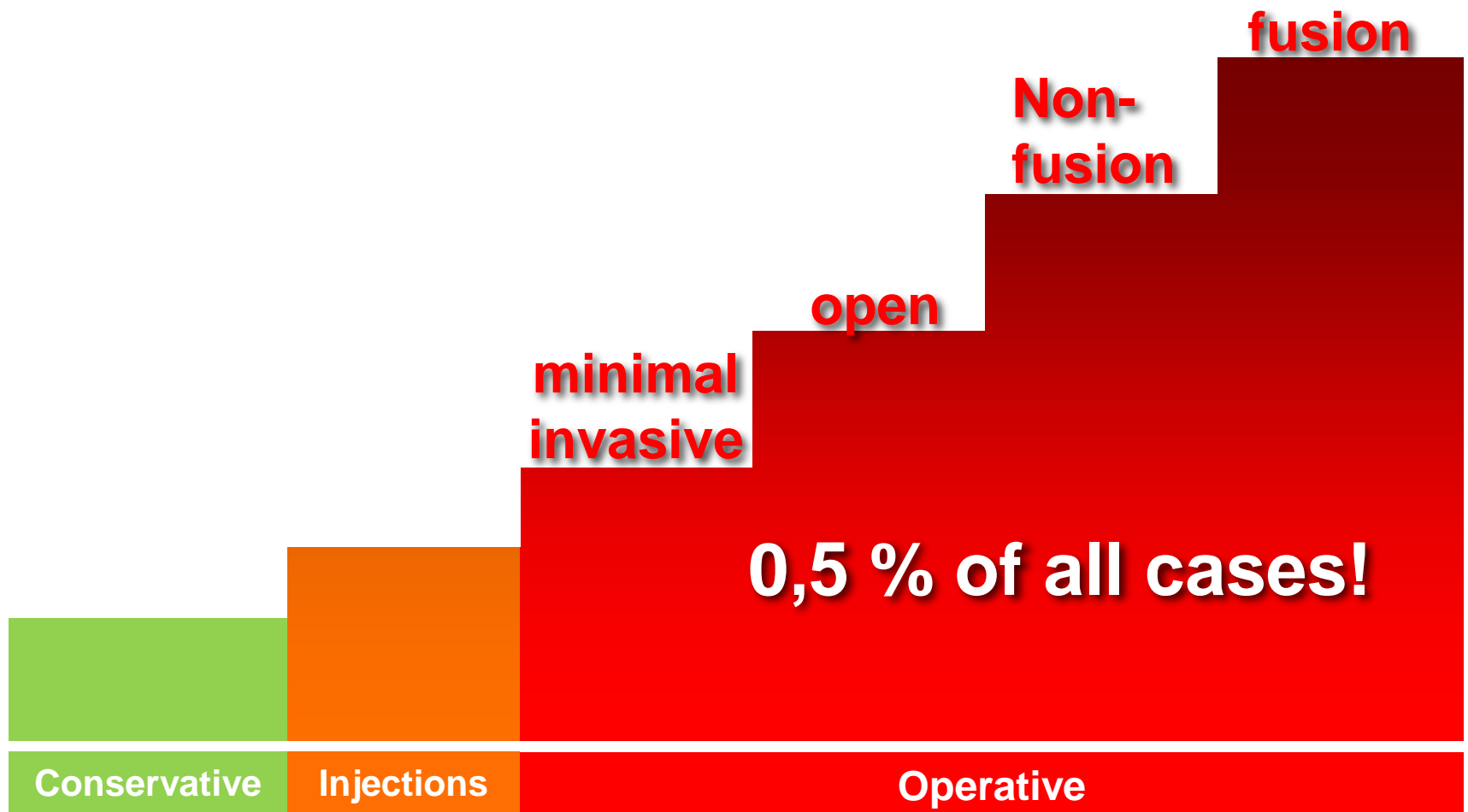
## What did the patients do?

Modality	n (%) <sup>a</sup>	Example
Pillow	57 (30)	Tried another pillow
Heat	148 (79)	Hot oil, UV lamp, warm blanket/shower/bath, sauna, warm cloths, solarium
Exercises	107 (57)	Neck loosening exercises, fitness training, improving posture
Rest	64 (34)	Keeping the neck as still as possible, holding rest
Massage	13 (7)	Massage applied to the neck by others
Soft collar	9 (5)	Wear a soft collar
Adjusted work	8 (4)	Adjusted work or adjusted work load
Complementary medicine	23 (12)	Acupuncturist, chiropractor, craniosacral therapist, nature healer, reiki, magnetiser

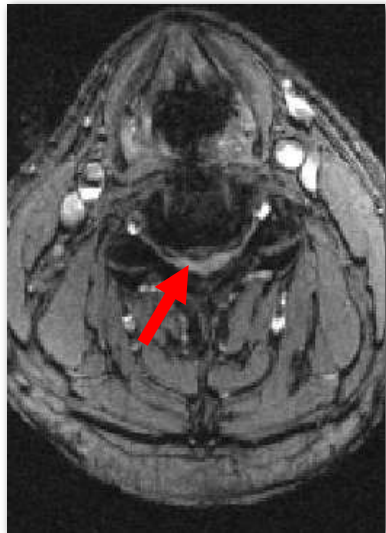
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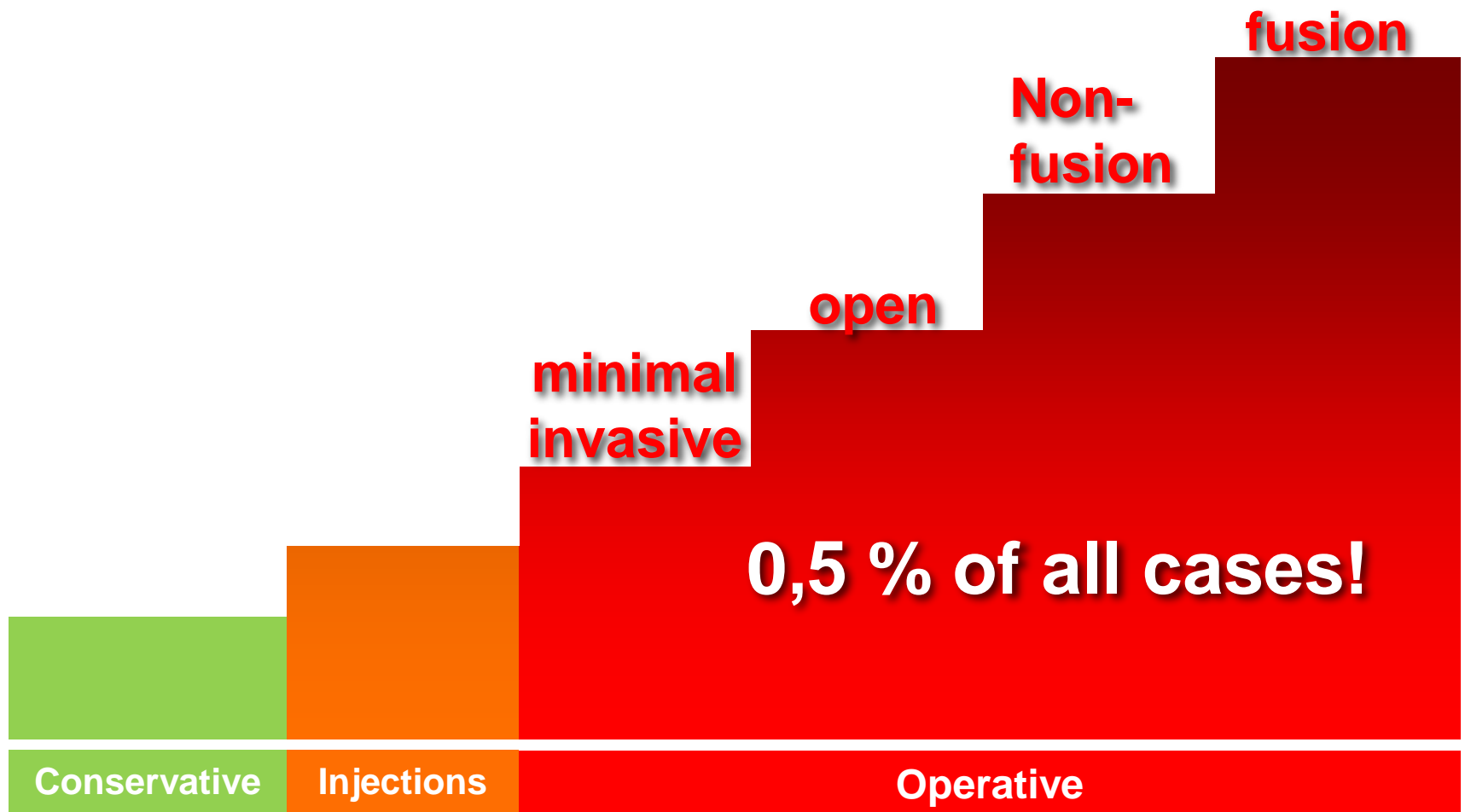
# HOW? What are the treatment options?



# Surgical procedures



# How effective are non-invasive treatment options?



# **Conservative interventions provide short-term relief for non-specific neck pain: a systematic review.**

Leaver AM<sup>1</sup>, Refshauge KM, Maher CG, McAuley JH.

## **Author information**

<sup>1</sup>Faculty of Health Sciences, The University of Sydney, Sydney, NSW, Australia. [andrew.leaver@sydney.edu.au](mailto:andrew.leaver@sydney.edu.au)

Systematic literature review: 33 trials were identified.

Significant short-term effects on pain with:

- Manipulation (-22, 95% CI -32 to -11),
- Multimodal intervention (-21, 95% CI -34 to -7)
- Specific exercise (MD -12, 95% CI -22 to -2)
- Combination orphenadrine/paracetamol (-17, 95% CI -32 to -2)
- Manual therapy (-12, 95% CI -16 to -7)
- Acupuncture (-8, 95% CI -13 to -2)
- Manual therapy (-6, 95% CI -11 to -2).
- Laser therapy resulted in better pain outcomes at medium-term follow-up but not at short-term follow-up.

Authors' conclusions:

*„Some conservative interventions for non-specific neck pain may improve pain or disability in the short, but not in the long-term“*

# Summary – the medical view

- Neck and back pain are related to muscular pain that will become chronic - Structural changes occurs if it remains untreated
- (Especially) office workers need guidance and continuous exercise - at the workplace!
- Pain may be already a late stage of a process
- Prevention saves health issues, sick-leave and is economically beneficial