

Average Time until Micturition and Ambulation were regained after Surgical Treatment of Thoracolumbar Disk Herniation in Relation to the Preoperative Neurological Score in 54 Dogs



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Objective of the Study



- To investigate the time necessary to regain controlled micturition and ambulation after surgical treatment of thoracolumbar Hansen type I intervertebral disk herniation and correlate this time to the preoperative modified Frankel score (MFS).



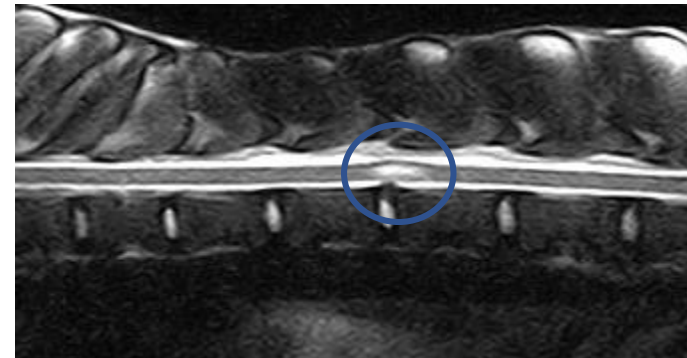
Clinical Interest?

- IVDE herniations are presented in many cases as emergencies
 - First care-takers are often non-specialists
 - Information about treatment outcome is necessary for the discussion with the owners
 - Ideally this information should be based on easy available data



Final Outcome of IVDE with Surgery

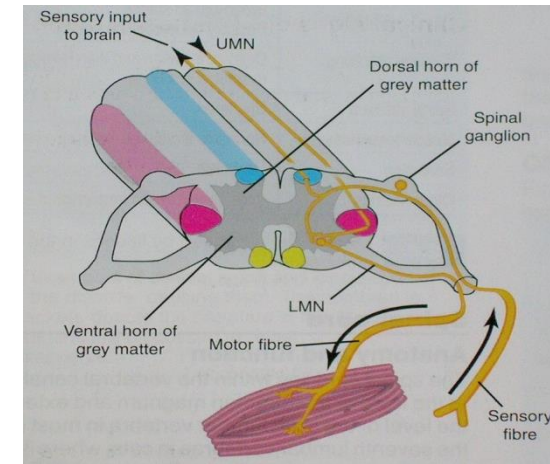
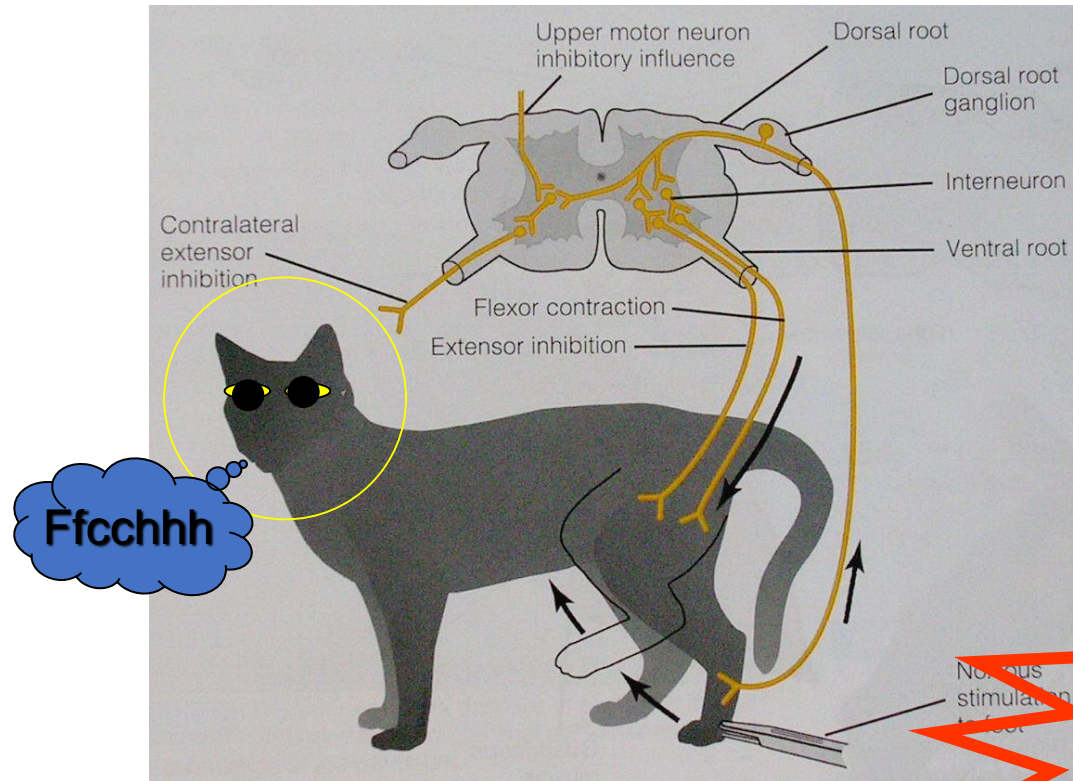
- Older and newer studies agree, that the outcome with surgery is successful in 86-96% of the non-ambulatory patients with intact DPP, finally regaining ambulation and bladder control
- Loss of DPP. The success rate in these patients after surgery is reported 0-76%, with an average around 50% (prognosis can be more accurate with MRI)



Deep Pain Perception



- Process by which pain is recognized and interpreted by the brain



Strong stimulus



Final Outcome of IVDE with Surgery

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- Do you NEED more to know?



Outcome of IVDE with Surgery

- Older and newer studies agree, that the outcome with surgery is successful in 86-96% of the non-ambulatory patients with intact DPP, finally regaining ambulation and bladder control
- Do you NEED more to know?
- Time of recovery is important for the owner!! (morbidity and costs)

Time to Urination: Important?



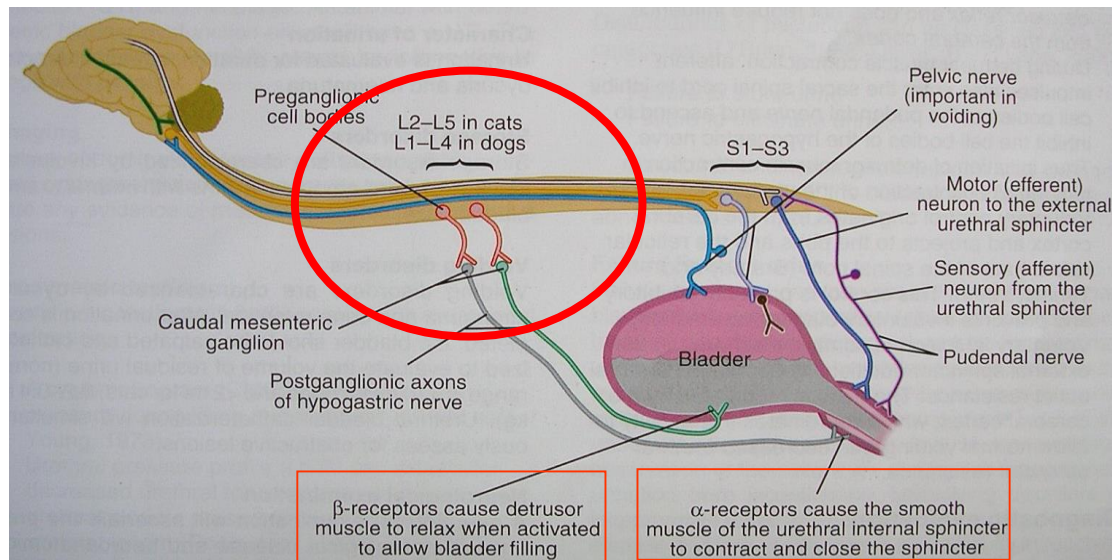
In clinical cases, the time needed to regain control of the bladder often determines the duration of hospitalization



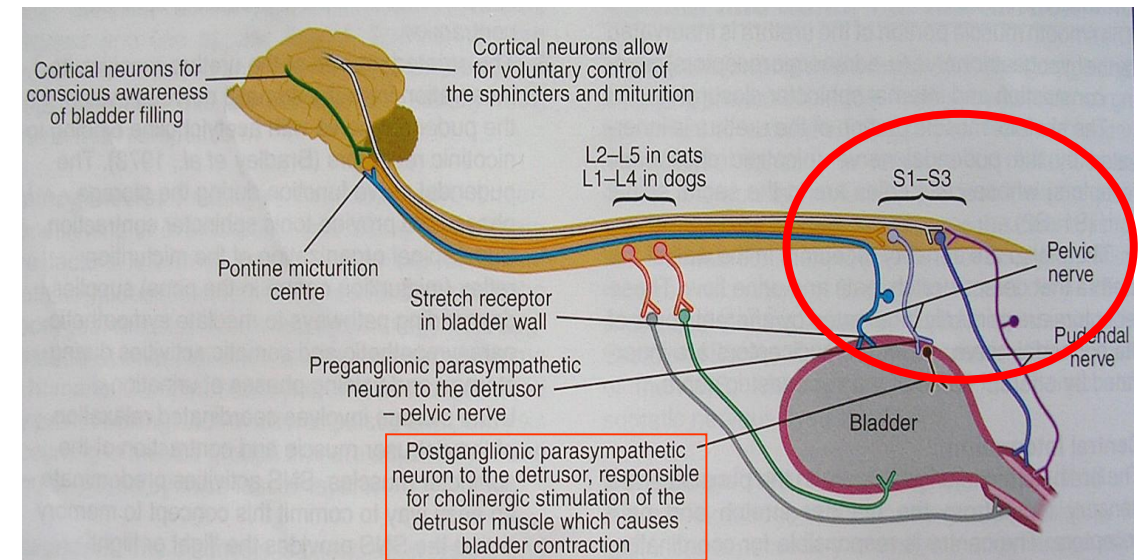
Bladder Physiology: Simple Switch-On Mechanism

- Filling the bladder and keep the sphincter closed is controlled by sympathetic nerves and the pudendal nerve
- Emptying the bladder and open the sphincter is mainly controlled by parasympathetic nerves

Storage Phase



Urination



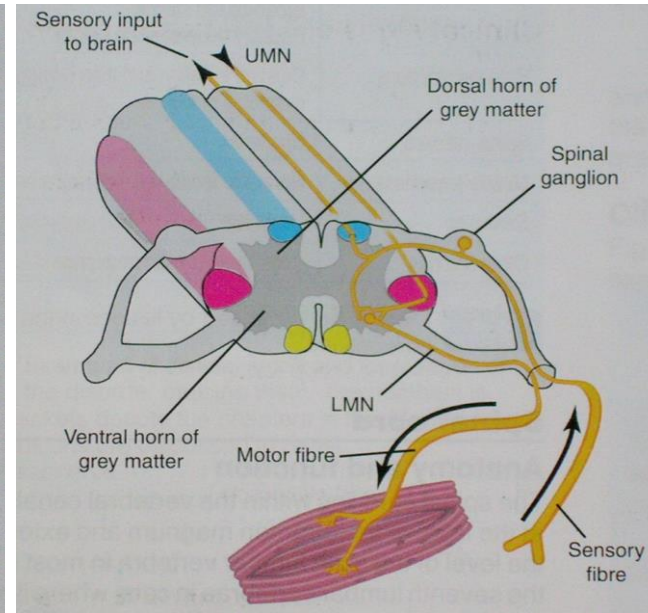
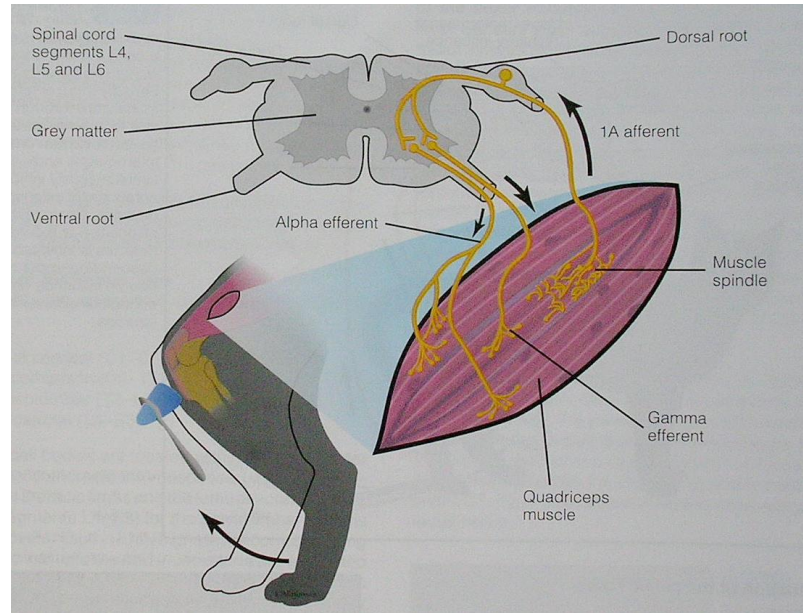
Mechanisms of Spontaneous Recovery in the Spinal Cord

- After injury, the spinal cord can spontaneously recover to varying degrees through a variety of biological mechanisms.
- Whatever recovery of function that occurs naturally after a spinal cord injury is largely the product of plasticity in the surviving neurons.

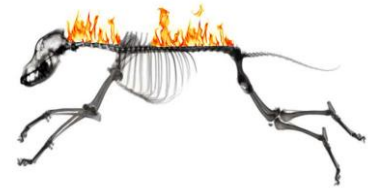
- Remyelination by Schwann cells entering the spinal cord after injury
- Remyelination by oligodendrocyte precursors
- Recovery of conduction in demyelinated axons
- Strengthening of existing synapses
- Regrowth and sprouting of intact axons to form new circuits
- Release of growth factors and guidance molecules
- Shift of function to alternate circuits

Walking Physiology: Complex Mechanism

- Brain coordinates the movements
- Central pattern generators in the spine contribute to locomotion



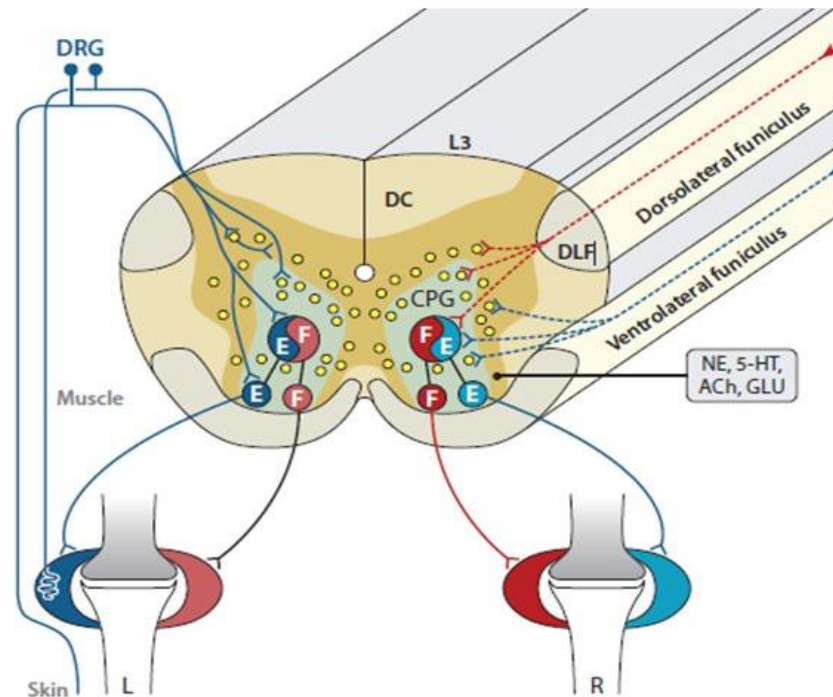
Walking Physiology: Complex Mechanism



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Central Pattern Generator (CPGs)

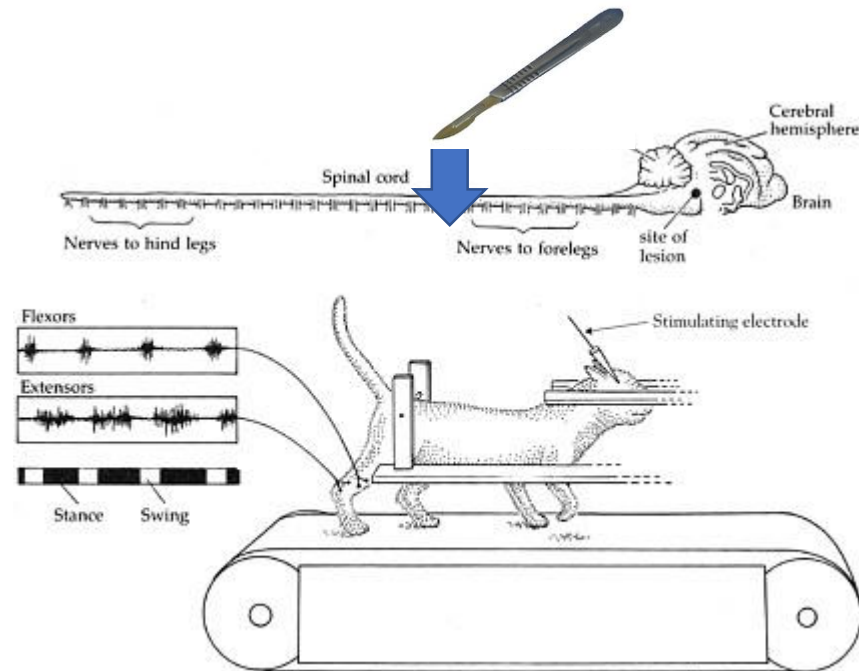
F flexor
motoneurons
E extensor
motoneurons
DC dorsal
columns
DRG dorsal
root ganglion



[Rossignol, 2011](#)

Walking Physiology: Complex Mechanism

- Experiments performed by Shik, Severin, and Orlovsky in the 1960s provided evidence of a central pattern generator (CPG), which is a complex circuit of neurons responsible for coordinated rhythmic muscle activity, such as locomotion



Outcome Prognosis based on Neurologic Status

- Most studies found a correlation between the severity of clinical signs and time to ambulation. The reported average time until ambulation is 7-14 days in chondrodystrophic patients
- Less information could be found in the literature regarding a correlation between the necessary time to regain control of urination and the preoperative neurological status
- In a publication, the average time to regain urination was 4.2 to 7.4 days. However, this study did not take into consideration the preoperative neurological scores and treated the hemilaminectomy patients as a single group



Study: Material and Methods

- 57 consecutive cases met the inclusion criteria during the study period (2015). 3 dogs with loss of DPP were euthanized during the study.
- All dogs had pre-operative MFS 4-0
- The Dachshund was the most common breed in this study (27)
- Mixed breed dogs (10), French Bulldogs (5), and Welsh Corgis (4). Bichon Havanais, Chinese Crested Dogs, Drevers, Cavalier KCS comprised the other affected breeds
- The mean age was 5.6 years (range 2-10 years)
- Twenty-four patients were males, and 19 patients were females, seven castrated males and seven sterilized females were included in the study.
- The mean bodyweight was 9.46 ± 5.4 kg (ranging from 3 to 20 kg).



Subtypes of IVDE Hansen Type I

Type	Name in Literature	Extruded Material	Clinical Features	Imaging Features	Therapy
Type I a	Hansen type I	degenerated NP	acute to slow progressing	compression with	surgery if non-ambulatory,
	Subtype I and 3		onset, mainly	partly calcified NP	prognosis often good
			chondrodystrophic breeds	over 1-2 vertebrae	
Type I b	DEEH,	degenerated NP	peracute/acute onset,	partly calcified NP	surgery (often extensive)
	Hansen I subtype 3		often severe symptoms	mixed with blood	prognosis good to guarded
	Dispersed IVDE			over 3 or more vertebrae	
Type I c	ANNPE, Traumatic IVDE, High velocity- low volume IVDE, Hansen 3	non-degenerated NP	peracute onset with trauma, often severe symptoms visible in MRI	often no compression, intramedullary changes	conservative if no compression, prognosis good to guarded
Type I d	IIVDE High velocity- low volume IVDE, Hansen 3	non-degenerated NP	peracute onset with trauma, often severe symptoms visible in MRI	often no compression, intramedullary nucleus material	if intramedullary nucleus material visible on MRI, surgery sometimes indicated
Type I e	HNPE	mildly degenerated NP	peracute/acute onset,	compression ventrally often no pain, mainly in the cervical spine	conservative or surgery with material isointense prognosis good to NP in MRI
Type I f	Far lateral IVDE	degenerated NP	radicular pain	NP in the foramen	surgery, perineural injection and lateral of the IVD, prognosis good



Modified Frankel Score MFS

Score 5: Normal gait with spinal hyperesthesia

Score 4: Ambulatory paresis

Score 3: Nonambulatory paresis with detectable muscle tone

Score 2: Paralysis with intact pain perception

Score 1: Paralysis with absent superficial pain perception

Score 0: Paralysis with absent deep pain perception

- Patients were daily examined and their progress documented. During hospitalization an individual rehabilitation program started immediately after surgery

Results: Age, Gender, Localisation, Compression, Duration



- No correlation between these parameters and the duration of recovery (ambulation and urination) was found in this study

➤ This is in agreement with the literature



Results

- 54 patients (95%) recovered from an IVDE after surgery
- Recovery time for ambulation was 13.8 ± 25.1 days
- The correlation with the MFS was $r = -0.64$
- Recovery time for urination was 4.1 ± 4.4 days
- The correlation with the MFS was $r = -0.63$



Results: Neurological Scoring

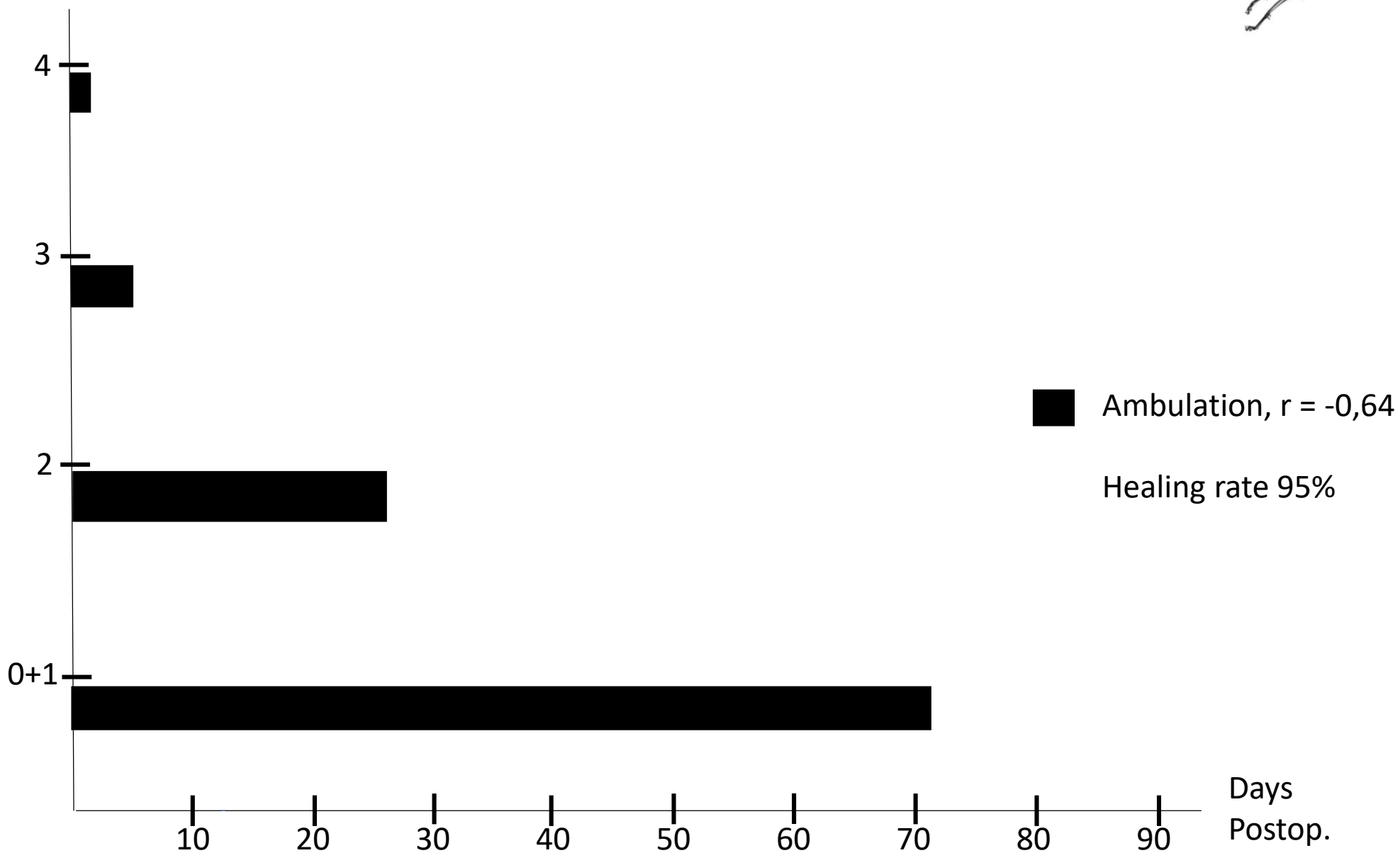
- A significant correlation between this parameter and the duration of recovery (ambulation and urination) was found in this study

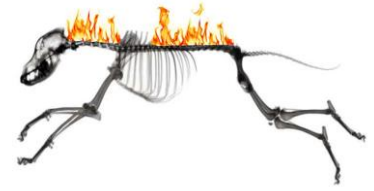
➤ *Results of the healing time within the different Frankel score groups*

Preoperative MFS (n)	Days to urinate	Days to ambulate	P u vs a
All (n=54)	4.1 ± 4.4	13.8 ± 25.1	>0.05
4 (n=17)	1.9 ± 1.98	1 ± 0	< 0.05
3 (n=23)	2.86 ± 1.1	6.9 ± 3.8	> 0.05
2 (n=10)	6 ± 3.5	28.8 ± 32.8	< 0.05
0 + 1 (n=4)	15.5 ± 7	71 ± 38	n. a.
Correlation	r = -0.63, P < 0.001	r = -0.64, P < 0.001	

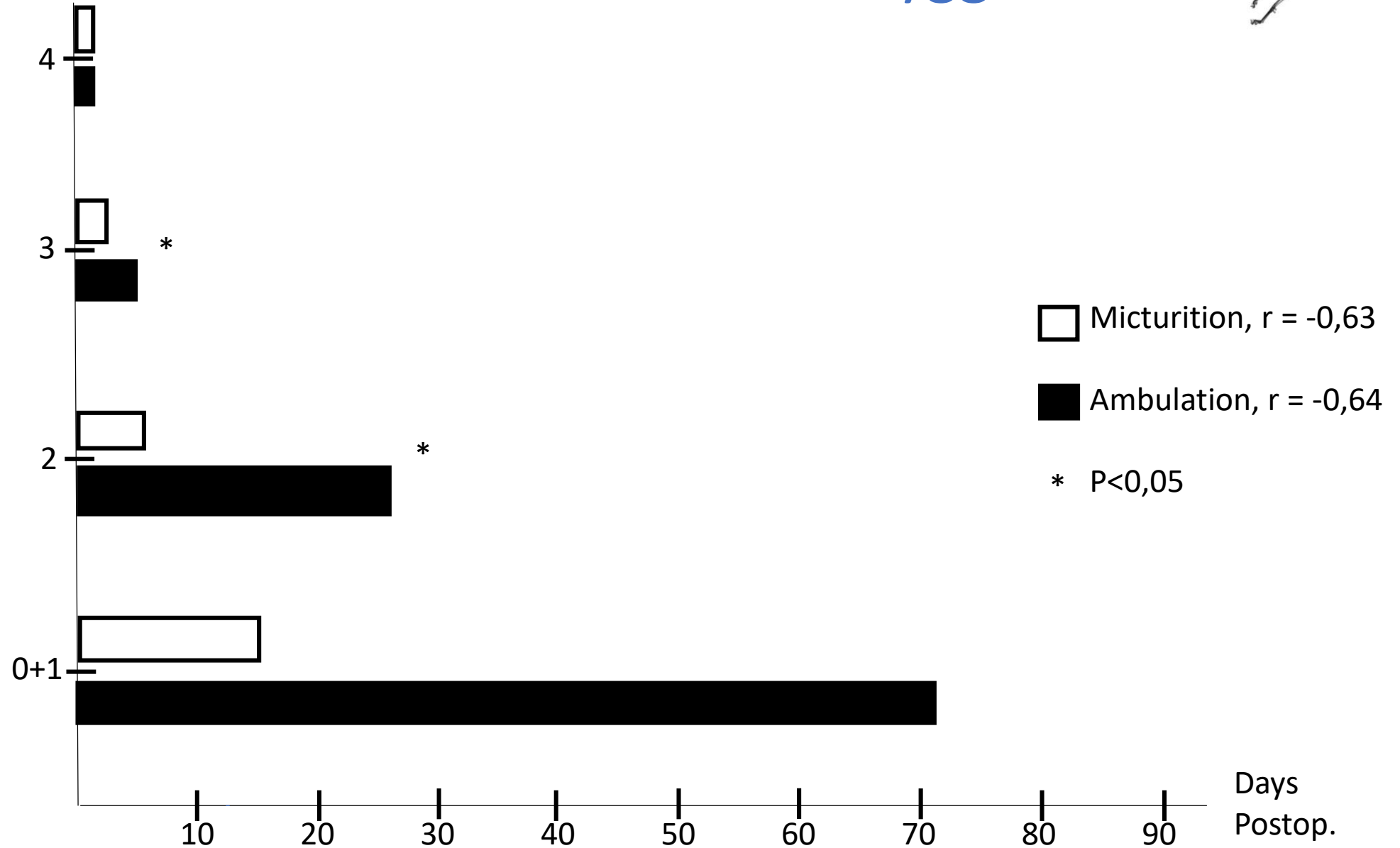


Preoperative MFS





Preoperative MFS



Tax så mycket

