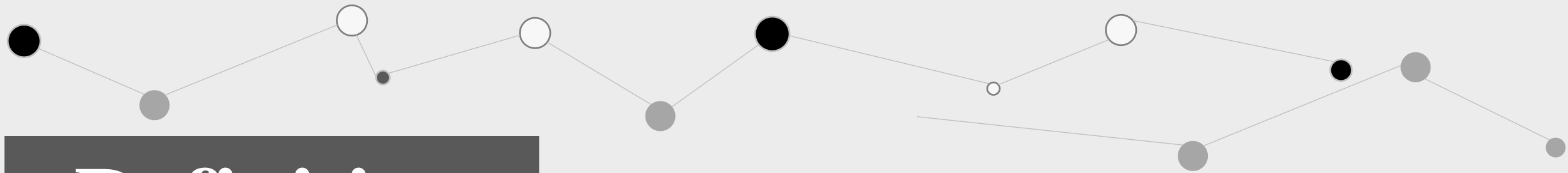




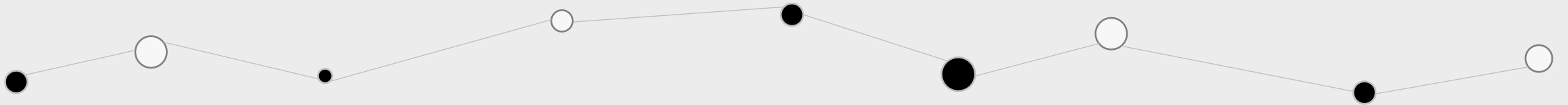
# The Clinical Assessment Tools and Non-Surgery Management of Spasticity

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Shen Yuxian 14364019  
Yi Lingrong 14364002



# Definition

- One component of the upper motor neurone syndrome
- Characterised by a velocity dependent increase in the tonic stretch reflexes with exaggerated tendon jerks, resulting from the hyperexcitability of the stretch reflex



# CONTENT

NO.1

**Scales  
Introduction**

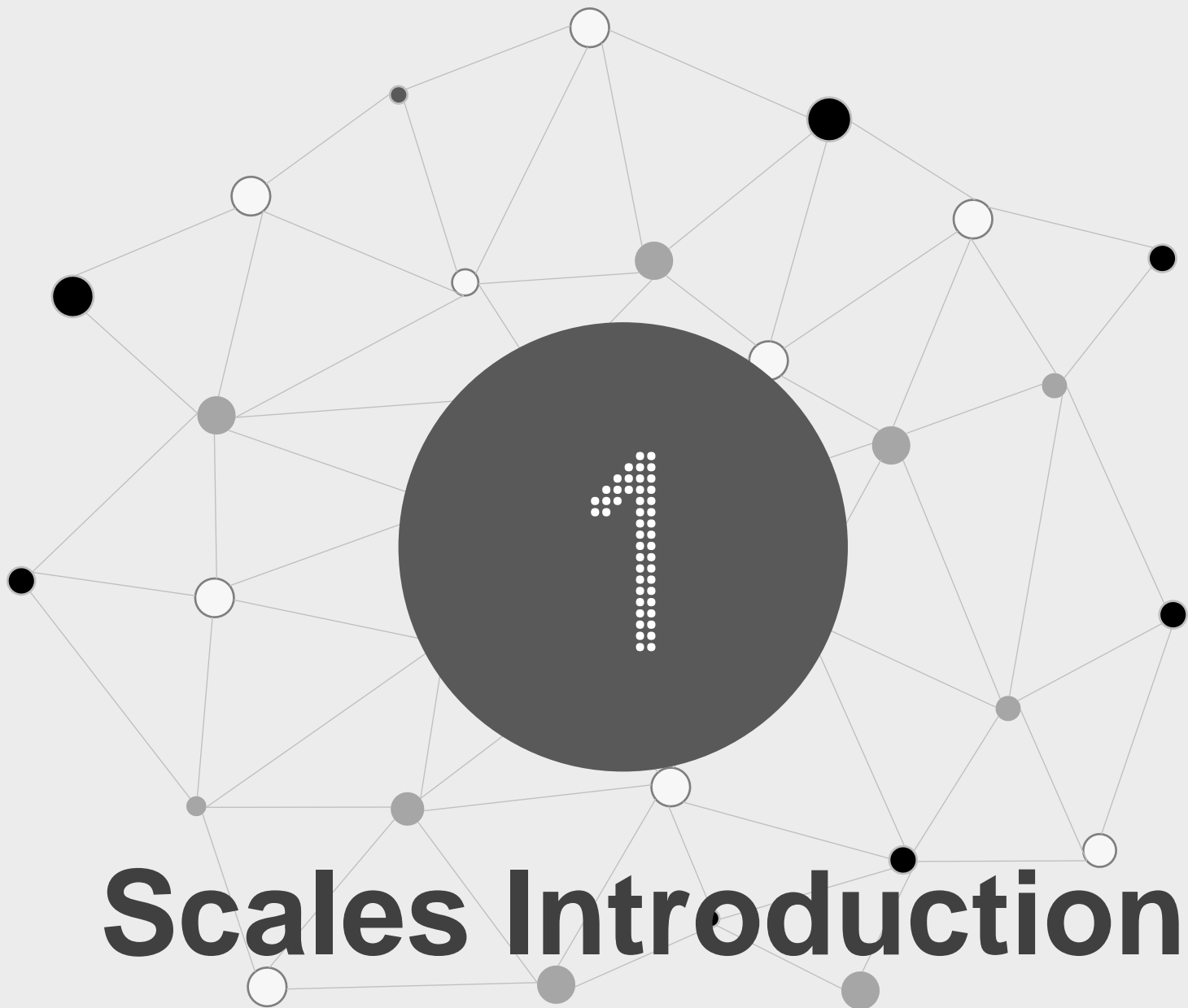
NO.3

**Non-Surgery  
Treatment**

NO.2

**Scales  
Demonstration**





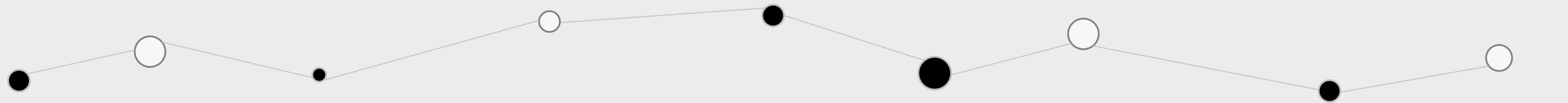
# Scales Introduction

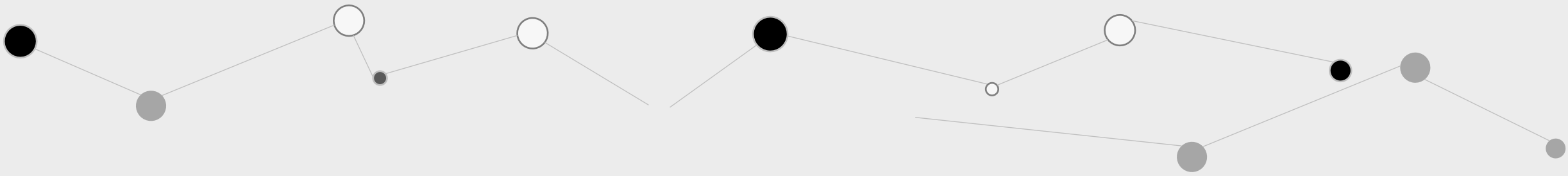


# Ashworth Scale (ASS)

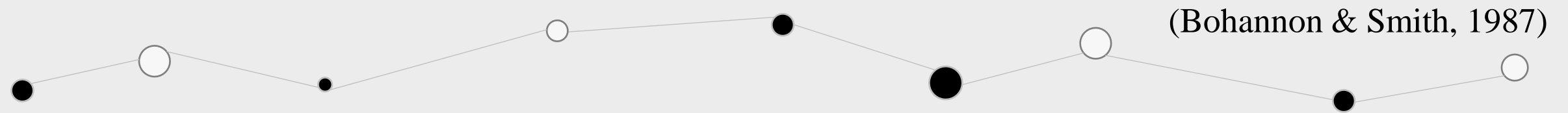
## Modified Ashworth Scale (MAS)

Grade	Ashworth Scale
0	No increase in tone
1	Slight increase in tone giving a catch when the limb was moved in flexion or extension
2	More marked increase in tone but limb easily flexed
3	Considerable increase in tone, passive movement difficult
4	Limb rigid in flexion or extension

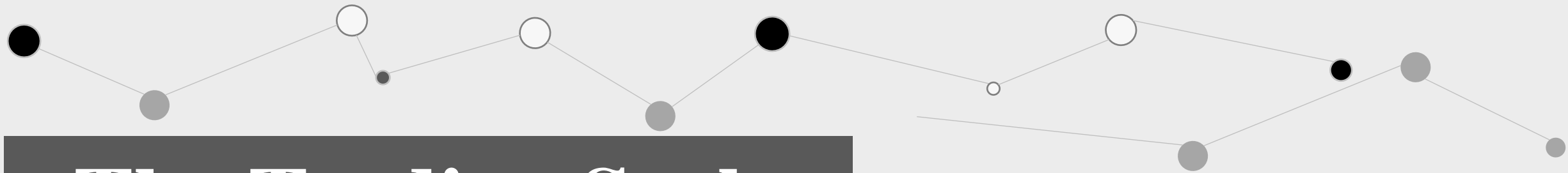




Grade	Modified Ashworth Scale
0	No increase in muscle tone
1	Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end of the range of motion (ROM) when the affected part is moved in flexion or extension
1+	<b>Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM</b>
2	More marked increase in muscle tone through most of the ROM, but affected parts easily moved
3	Considerable increase in muscle tone, passive movement difficult
4	Affected part rigid in flexion or extension



(Bohannon & Smith, 1987)



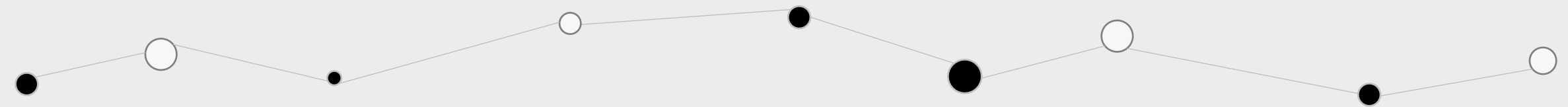
# The Tardieu Scale

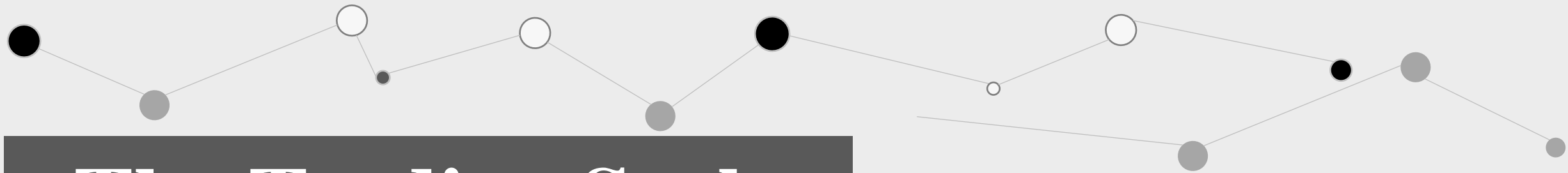
Velocity of stretch:

V1: As slow as possible (minimizing stretch reflex)

V2: Speed of the limb segment falling under gravity

V3: As fast as possible (faster than the rate of the natural drop of the limb segment under gravity)





# The Tardieu Scale

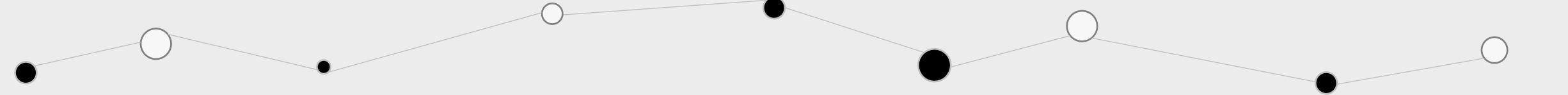
Resulting joint angles definition

**R1** (the angle of catch following a fast velocity stretch - during either V2 or V3)

**R2** (passive range of motion following a slow velocity stretch - V1)

**A large difference** : large dynamic component with a greater capacity for change or improvement

**A small difference** : predominantly fixed contracture in the muscle with a poorer capacity for change





# Composite Spasticity Scale (CSS)

以踝关节为例,CSS 的评定内容则包括跟腱反射、踝跖屈肌群肌张力、踝阵挛,其评定方法及具体的评分标准如下:

**(1)跟腱反射:**患者仰卧位,髋外展,膝屈曲。检查者使踝关节稍背伸,保持胫后肌群一定的张力,用叩诊锤叩击跟腱。

0分:无反射;1分:反射减弱;2分:反射正常;3分:反射活跃;4分:反射亢进。

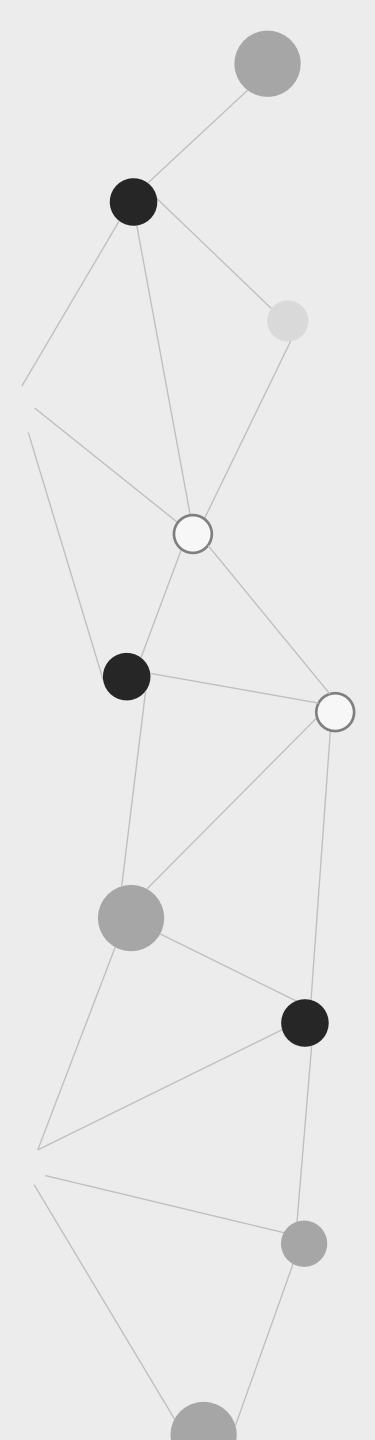
**(2)踝跖屈肌群肌张力:**患者仰卧位,下肢伸直,放松。检查者被动全范围背伸踝关节,感觉所受到的阻力。

0分:无阻力(软瘫);2分:阻力降低(低张力);4分:正常阻力;6分:阻力轻度到中度增加,尚可完成踝关节全范围的被动活动;8分:阻力重度(明显)增加,不能或很难完成踝关节全范围的被动活动。

**(3)踝阵挛:**患者仰卧位,下肢放松,膝关节稍屈曲。检查者手托足底快速被动背伸踝关节,观察踝关节有无节律性的屈伸动作。

1分:无阵挛;2分:阵挛1~2次;3分:阵挛2次以上;4分:阵挛持续超过30秒。

**结果判断:**0~7分为无痉挛,8~9分为轻度痉挛,10~12分为中度痉挛,13~16分为重度痉挛。



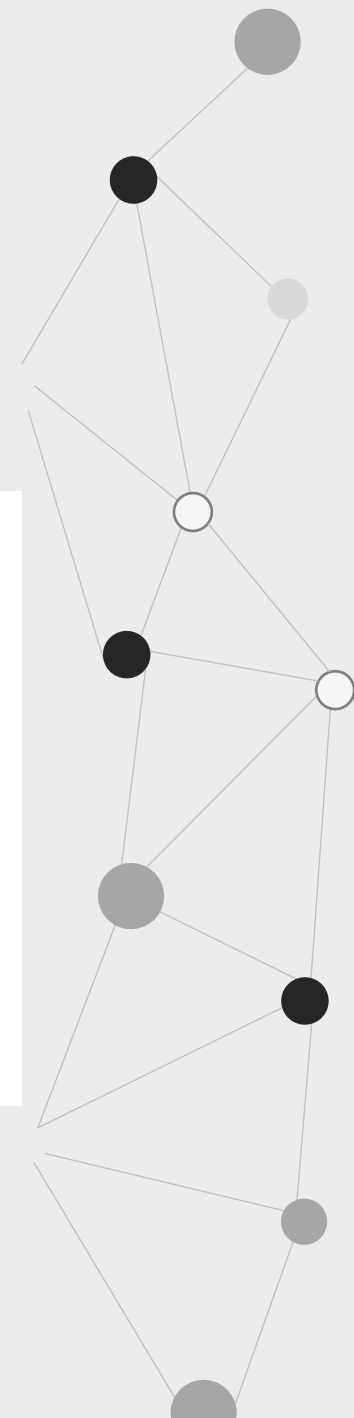
# Spasm Frequency Scale

## Penn Spasm Frequency Scale

Level	Description
0	No spasm
1	Mild spasms induced by stimulation
2	Infrequent full spasms occurring less than once per hour
3	Spasms occurring more than once per hour
4	Spasms occurring more than 10 times per hour

### 表4 每天痉挛频率量表

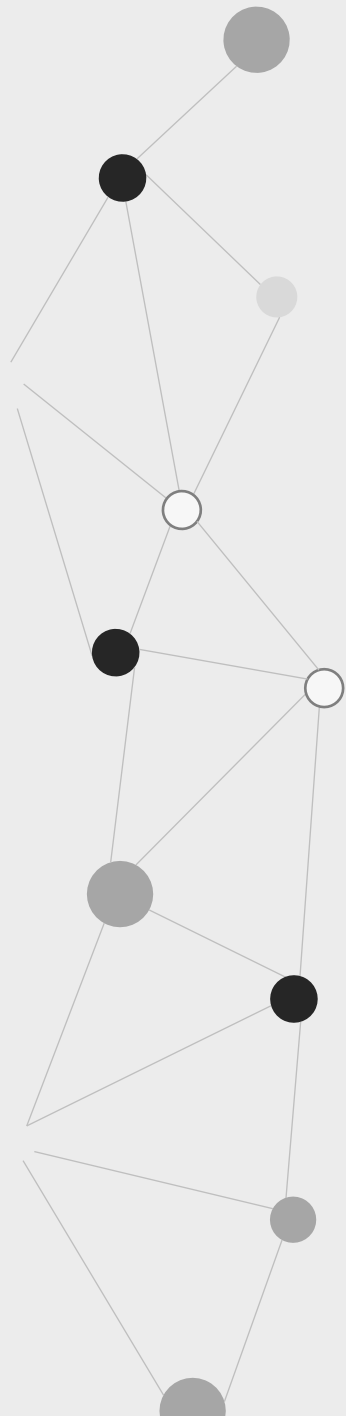
- 0 无痉挛
- 1 极少或1次痉挛
- 2 1~5次痉挛
- 3 6~9次痉挛
- 4 10次以上或持续性收缩



# Clonus Score

表 5 痉挛的阵挛评分

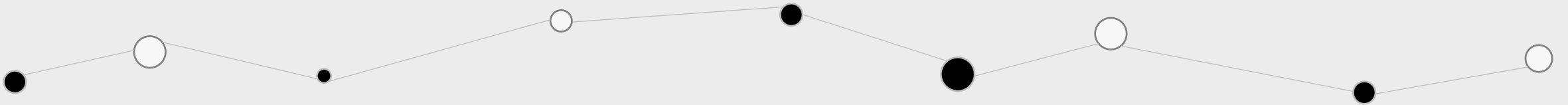
- |   |                 |
|---|-----------------|
| 0 | 无踝阵挛            |
| 1 | 踝阵挛持续时间 1~4 秒   |
| 2 | 踝阵挛持续时间 5~9 秒   |
| 3 | 踝阵挛持续时间 10~14 秒 |
| 4 | 踝阵挛持续时间超过 15 秒  |





# Instrumented Measurement Tools

- Electrophysiological measures ( 电生理学检查 )
- Pendulum ( 钟摆 ) test



# Scale Classification

## Upper limbs

ASS and MAS

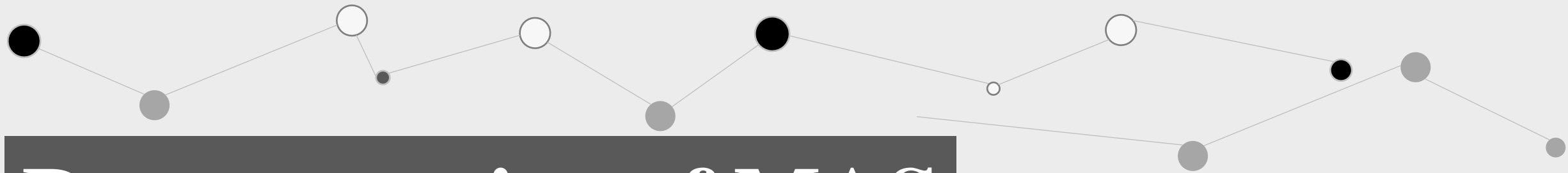
## Lower limbs

- TS and MTS
- CSS
- The spasm frequency scale
- Clonus score

(谢芹, 2003)



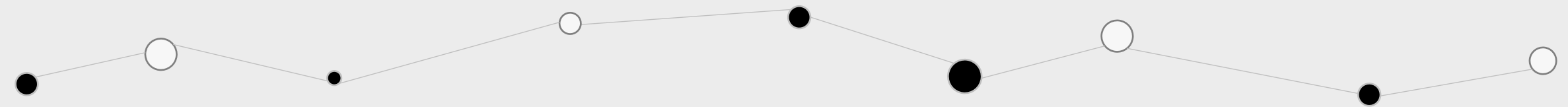
# Scales Demonstration

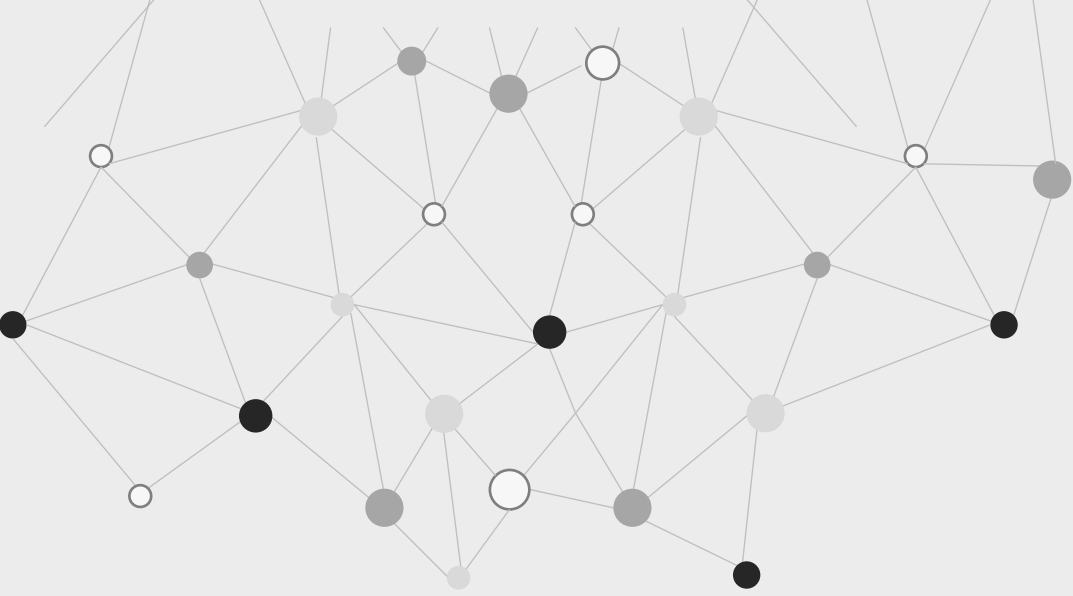


# Demonstration of MAS

Patients : laying in relaxed posture

PT : move upper limb quickly "one thousand and one"  
feel the strength and range of resistance





Movement :

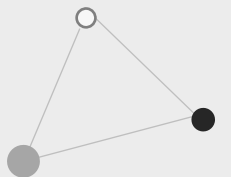
Shoulder abduction / flexion

Elbow flexion / extension

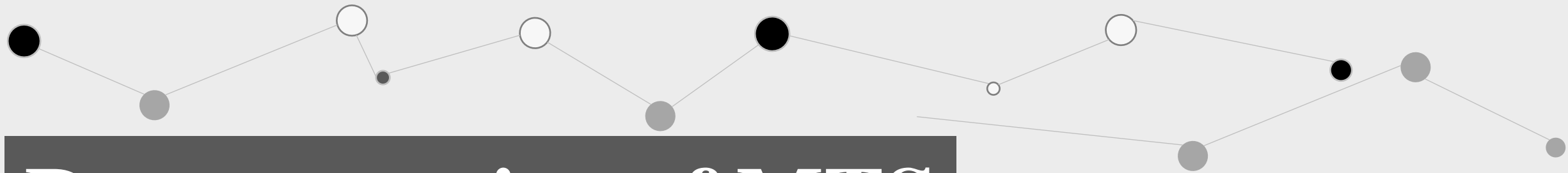
Forearm supination / pronation



(Source : [www.bing.com](http://www.bing.com))



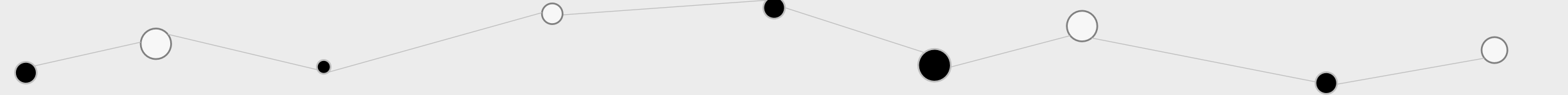


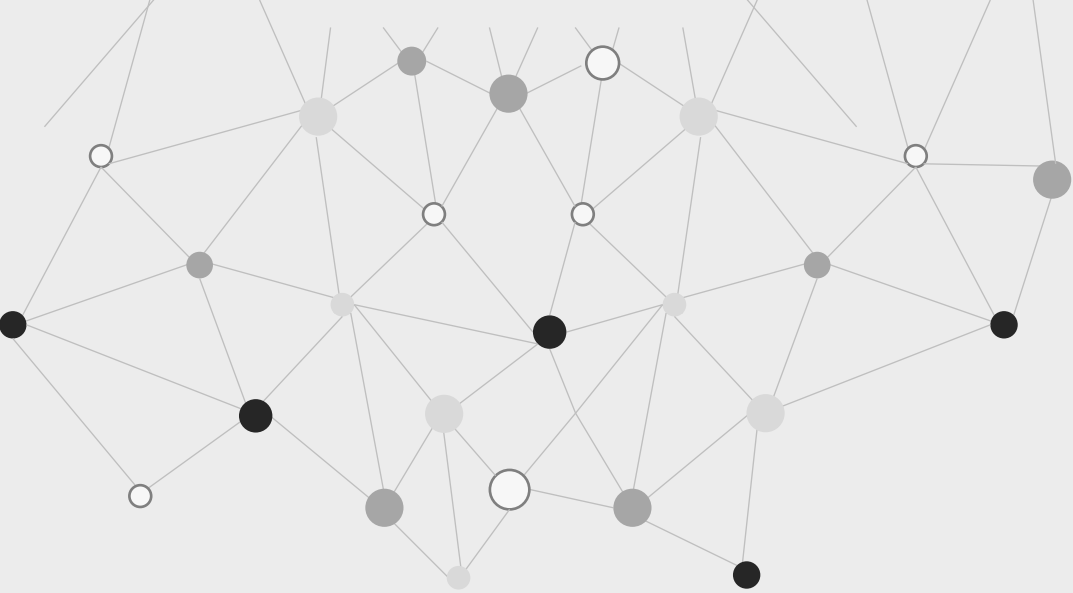


# Demonstration of MTS

Patients : lying in relaxed posture

PT : move patient in three speeds  
record locking angle (R1 /R2)  
feel resistance



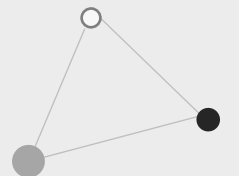


Movement :

Hip lateral / medial rotation  
flexion /extension

Knee flexion / extension

(Source : [www. bing. com](http://www.bing.com))





**Non-Surgery Treatment**

# Non-surgery treatment



**Removal of Noxious Stimuli**

**Proper Posture**

**Physical Therapy**

**Occupational Therapy**

**Oral Medications**

**Botulinum Toxin Type A**



# Management of Spasticity

Clearly identifying the goals of the patient and caregivers.

- Does the patient need treatment?
- What are the aims of treatment?
- Do the patient and caregivers have the time required for treatment ?
- Will treatment disrupt the life of the patient and caregivers?

(Lalith E. Satkunam,2003)



# Removal of Noxious Stimuli

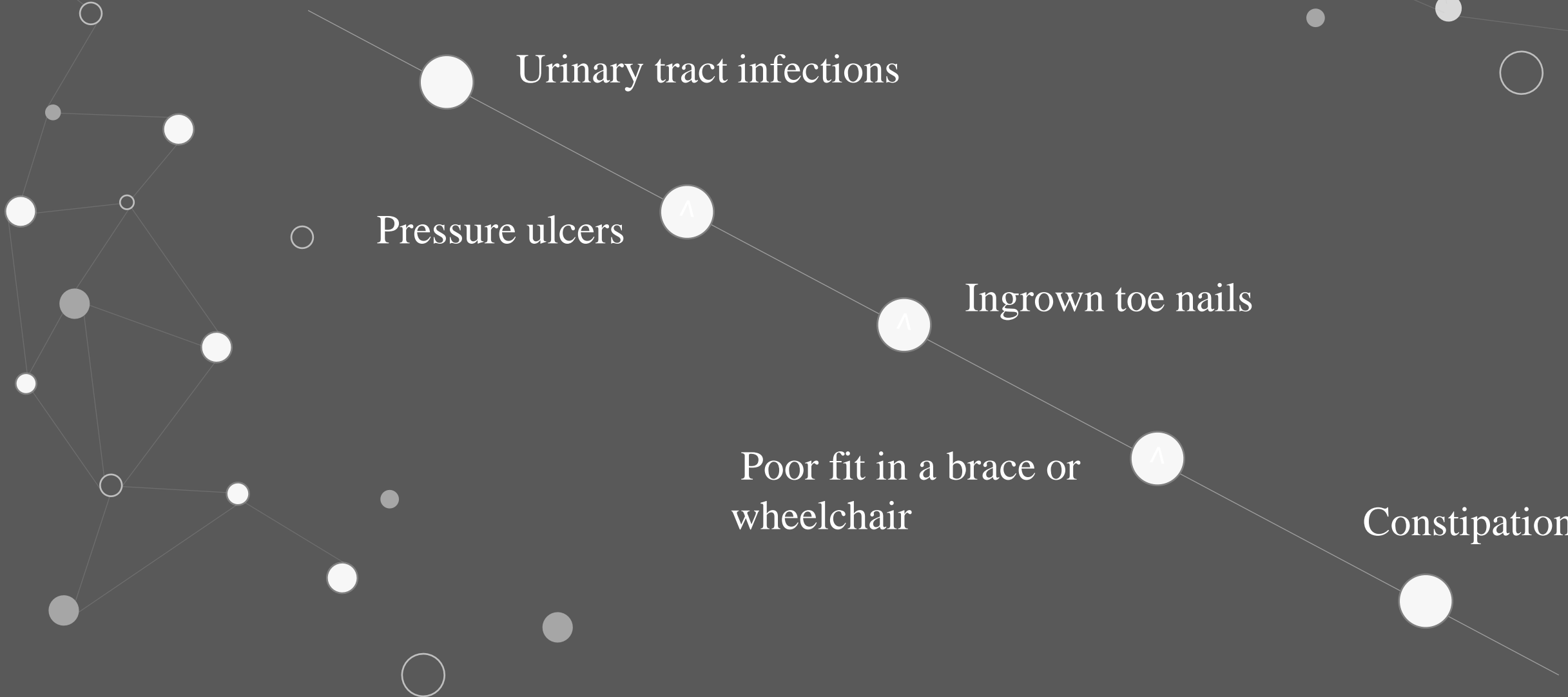
Urinary tract infections

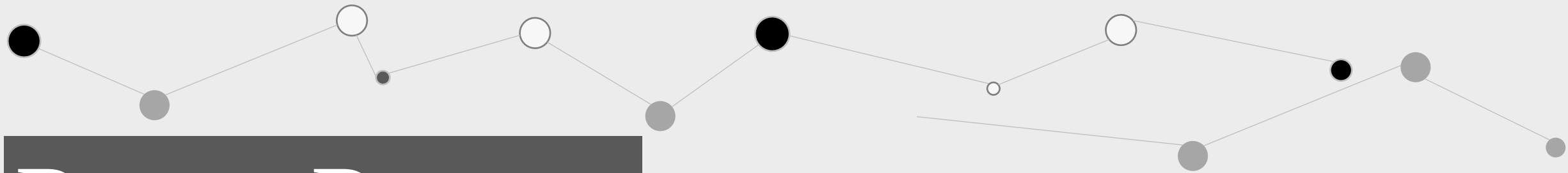
Pressure ulcers

Ingrown toe nails

Poor fit in a brace or  
wheelchair

Constipation



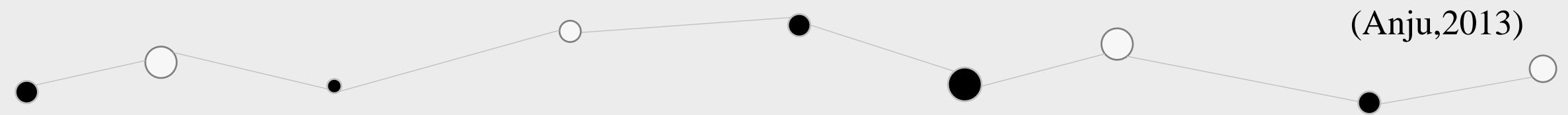


# Proper Posture

Product stretch on the spastic muscles

Facilitating the use of antagonistic muscle groups

(Seating) stabilize the pelvis with a slight anterior tilt



(Anju,2013)



# Physical Therapy

## Physical Agent

Electrical stimulation (functional electrical stimulation)

Ultrasound

TENS

Cold or heat therapy

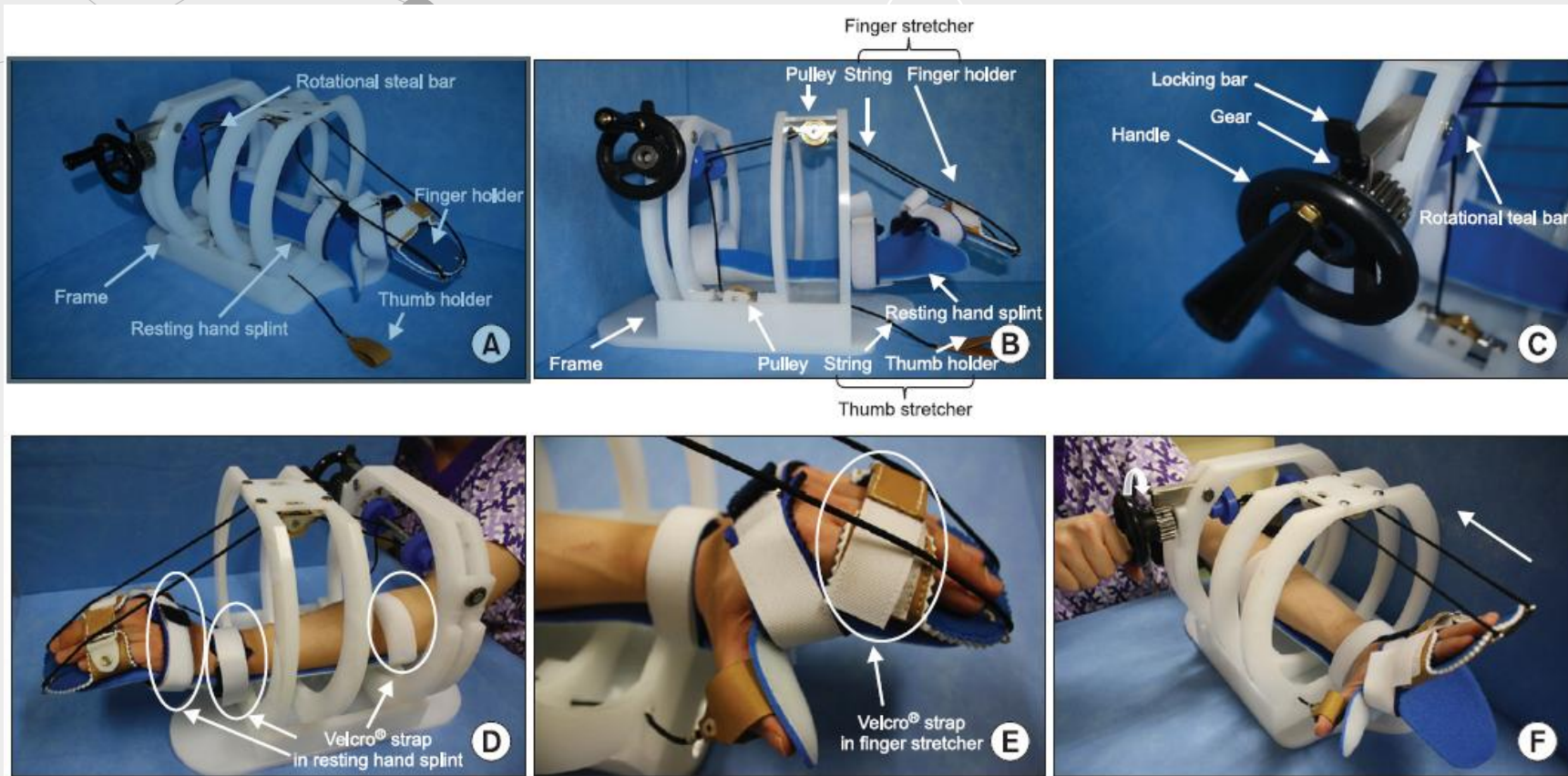
## Stretching

Short stretching( in seconds)

Sustained stretching(minutes to hours)

Chronic stretching(days to weeks)

# Hand-Stretching Device



(Eun Hyuk Kim, 2013)

# Occupational Therapy

Brace

Functional training

ADL (roll over in bed)

Keep in balance

Stand and sit

Walking exercise



(Source : [www.bing.com](http://www.bing.com))

# Oral Medications

Drug	Initial dose	Daily maximum	Mechanism of action	Common side effects
Baclofen	5 mg 3 times daily	80 mg (can be higher if side effects are not a problem). Best divided into 4 doses	Centrally acting GABA analogue. Binds to GABA <sub>B</sub> receptor at the presynaptic terminal and thus inhibits the muscle stretch reflex	Daytime sedation, dizziness, weakness, fatigue, nausea; lowers seizure threshold <i>Withdrawal seizures and hallucinations with abrupt discontinuation</i>
Dantrolene	25 mg	100 mg 4 times daily	Interferes with the release of calcium from the sarcoplasmic reticulum of the muscle	Generalized muscle weakness, mild sedation, dizziness, nausea, diarrhea <i>Hepatotoxicity (liver enzymes should be monitored)</i>
Tizanidine	2–4 mg	36 mg	Imidazole derivative, with agonist action on alpha-2 adrenergic receptors in central nervous system	Dry mouth, sedation, dizziness, mild hypotension, weakness (less common than with baclofen) <i>Liver enzymes should be monitored</i>
Clonidine	0.05 mg twice daily	0.1 mg 4 times daily	Acts at multiple levels as an alpha-2 agonist in the central nervous system	Bradycardia, hypotension, depression, dry mouth, sedation, dizziness, constipation <i>Monitor pulse and blood pressure during treatment</i>
Gabapentin	100 mg 3 times daily	600–800 mg 4 times daily	GABA analogue. May have an indirect effect on GABA-ergic neurotransmission	Somnolence, dizziness, ataxia and fatigue



# Botulinum Toxin Type A

Clinical Effect :

Reduce muscle tone

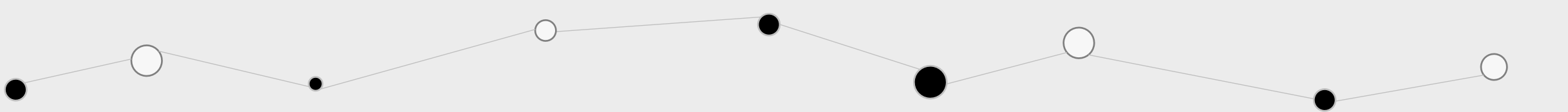
Physiotherapy or occupational therapy support

Increase range of motion

Pain reduction

Facilitation of care or hygiene

( Jost , 2014 )





# Botulinum Toxin Type A

Operation Method :

Positioning : ultra sound or EMG

Number :3-5 points in each muscle

Dose : no more than 600U (or 400U)

Interval : at least 3 months

( 李江 , 2016 )

**Follow-up measure : cooperate with exercise training**

( Saita et al. 2017 )



# Summary

Assessment :

The most popular scale to evaluate muscle tone is modified Ashworth Scale, which ought to master

---

Treatment:

First, assess whether he/she need

- Second, other methods just release symptoms , exercise is significant way to improve prognosis.

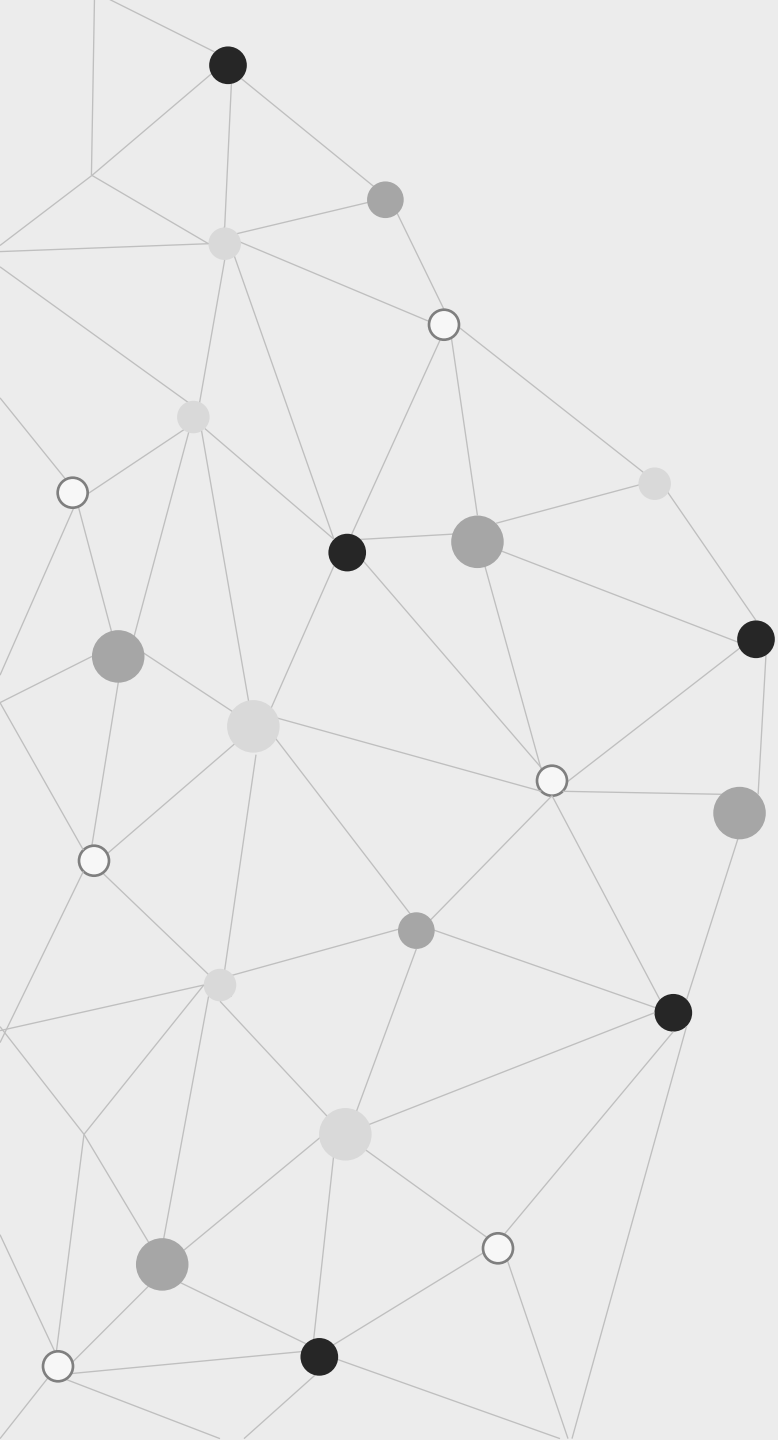
# Reference

1. Haugh A B, Pandyan A D, Johnson G R. A systematic review of the Tardieu Scale for the measurement of spasticity[J]. *Disability and rehabilitation*, 2006, 28(15): 899-907.
2. Waninge A, Rook R A, Dijkhuizen A, et al. Feasibility, test–retest reliability, and interrater reliability of the Modified Ashworth Scale and Modified Tardieu Scale in persons with profound intellectual and multiple disabilities[J]. *Research in developmental disabilities*, 2011, 32(2): 613-620.
3. Aloraini S M, Gäverth J, Yeung E, et al. Assessment of spasticity after stroke using clinical measures: a systematic review[J]. *Disability and rehabilitation*, 2015, 37(25): 2313-2323.
4. Patrick E, Ada L. The Tardieu Scale differentiates contracture from spasticity whereas the Ashworth Scale is confounded by it[J]. *Clinical rehabilitation*, 2006, 20(2): 173-182.
5. Ansari N N, Naghdi S, Hasson S, et al. The Modified Tardieu Scale for the measurement of elbow flexor spasticity in adult patients with hemiplegia[J]. *Brain Injury*, 2008, 22(13-14): 1007-1012.
6. Ben-Shabat E, Palit M, Fini N A, et al. Intra-and interrater reliability of the Modified Tardieu Scale for the assessment of lower limb spasticity in adults with neurologic injuries[J]. *Archives of physical medicine and rehabilitation*, 2013, 94(12): 2494-2501.
7. Satkunam L E. Rehabilitation medicine: 3. Management of adult spasticity[J]. *Canadian Medical Association Journal*, 2003, 169(11): 1173-1179.



# Reference

8. Anju, Ghai, Nidhi, Garg, Sarla, Hooda, and, Tushar, Gupta. Spasticity – Pathogenesis, prevention and treatment strategies[J]. Saudi J Anaesth, 2013 Oct-Dec, 7(4): 453-460
9. Eun, Hyuk, Kim, Min, Cheol, Jang. The Effect of a Hand-Stretching Device During the Management of Spasticity in Chronic Hemiparetic Stroke Patients[J]. Annals of Rehabilitation Medicine, 2013, 37(2): 235-240
10. Wolfgang H. Jost et al. Efficacy and safety of botulinum toxin type A (Dysport) for the treatment of post-stroke armpasticity: Results of the German–Austrian open-label post-marketing surveillance prospective study [J] Journal of the Neurological Sciences 337 (2014) 86–90
11. Kazuya Saita et al. Combined therapy using botulinum toxin A and single-joint hybrid assistive limb for upper-limb disability due to spastic hemiplegia [J] Journal of the Neurological Sciences 373 (2017) 182–187
12. 燕铁斌, 许云影. 综合痉挛量表的信度研究 [J][J]. 中国康复医学杂志, 2002, 17(5): 263-265.
13. 燕铁斌. 临床痉挛指数: 痉挛的综合临床评定[J]. 现代康复, 2000, 4(1): 88-89.
14. 胡昔权. 痉挛的评定和综合性治疗[C]//中国康复医学会第十一届全国脑血管病康复学术会议论文汇编. 2008.
15. 谢芹, 王培生. 痉挛的物理治疗[J]. 国外医学-物理医学与康复分册, 2003, 23(2): 83-861
16. 李江 A 型肉毒毒素与酒精局部注射治疗脑卒中后下肢肌痉挛的对比研究 [J]中华物理医学与康复杂志 2016年7月第38卷第7期 504-508



**THANKS**

