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**Passive and Voluntary Movements in the Analysis
of Spastic Paresis****Evert Knutsson***

Spasticity is recognized by the increased restraint to passive movements, enhanced tendon jerks and clonus. These signs are all due to exaggerated activation of muscle stretch reflexes. They can be quantified by measuring the responses to passive movements of well defined range and speeds.

In voluntary movements, some muscles are necessarily stretched by the movements. Thus, in concentric movements, antagonistic muscles are stretched, while in eccentric movements, the agonists are stretched. The question then arises how the exaggerated stretch reflexes in spastic patients will affect the voluntary movements.

To study this, the maximal strength during voluntary knee extension and flexions was recorded together with rectified surface EMG from agonistic and antagonistic muscles. The movements were controlled by an isokinetic dynamometer (Kin-Com III) that allows tests of concentric as well as eccentric work at different constant speeds of angular rotation. Voluntary concentric and eccentric movements as well as passive movements were studied at velocities of 30, 60, 120, 180 and 240 degrees per second in patients with spasticity and in healthy subjects.

In healthy subjects, the antagonistic muscles are usually activated to some extent during voluntary movements at high effort. The resul-

tant muscle contraction gives stabilization to the joint. This normal antagonist activation is of equal magnitude in concentric, and eccentric movements, i.e., independent on whether the antagonist is stretched or not by the movement. Consequently, it can not be ascribed to stretch reflex activation. Most likely it is due to descending supraspinal commands.

Also in spastic patients, there is an activation of antagonistic muscles during voluntary movements but the activation differs markedly in concentric and eccentric work. In concentric movement where antagonistic muscles are stretched, there is a clearly increased activation of the antagonists and the activation is usually larger than during passive stretch of equal range and speed. The faster the movement, the more are the antagonists activated as can be expected when the activation is due in part to excitation of the highly velocity sensitive muscle spindles. Thus, a stretch reflex activation is added to the normal antagonist activation caused by descending commands.

In spasticity, the antagonist activation in eccentric movements is less than in concentric movements, and not different from that seen in healthy subjects. In eccentric movements the antagonists are not stretched and thus they can not be activated through stretch reflexes. In contrast, the agonists are stretched in eccentric work. Thus, the voluntary activation of the

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agonists in eccentric work can gain support by activation through stretch reflexes. As expected from this concept the agonist activation is relatively well preserved in eccentric work.

In spasticity, agonists are usually poorly activated in concentric movements partly due to deficient descending commands. There

seems, however, to be also a segmental mechanism that compromises agonist activation. It is due to reciprocal inhibition emanating from the afferent inflow from the antagonistic muscles which has inhibitory effects upon the mononeurons of the agonists.

書評

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脳血管障害のリハビリテーションにおける 検査案内図譜

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人口の高齢化に対する社会的対応の必要性が叫ばれている中で、脳卒中のリハビリテーションの重要性が次第に認識されてきた。それと同時に脳血管障害のリハビリテーションに対して、より客観的根拠、より効率的な展開を求める声も大きくなってきている。客観的な情報を得るために、リハビリテーション医療の中にも種々の検査方法が導入されている。経験的ではなく、種々の検査情報を統合してリハビリテーションを進める立場は今後も一層重視されるようになると思われる。

この本は図譜の形式をとり、脳卒中で用いられる検査の項目、目的、手技について分かりやすく解説した内容となっている。専門的

に検査手技を修得するための手引書ではなく、むしろ視覚的表示と簡単な説明によって、種々の検査の概略的な理解を助けることを目的とした本である。著者らの意図する使用目的は患者への検査内容の説明である。患者への検査の説明はふつう簡単な図示、レントゲン写真の提示などでなされるが、十分理解されたかどうか自信のない時もしばしばある。このような図譜を活用すると便利であろう場面が思い浮かぶ。

本の構成は検査案内図譜と解説の2つからなる。図譜では検査場面や検査結果が鮮明に図示され、解説にはそれらの検査について簡潔にまとめられている。項目としては脳・脳血管画像診断とともに、

体性感覚誘発電位、聴覚脳幹応答、歩行分析、体力、ウロダイナミックス検査、嚥下ビデオ・レントゲン検査などの機能検査が含まれている。種々の機能検査は特に脳卒中のリハビリテーション医療で重要なものばかりである。

検査の専門書としてではなく、患者、関連職種に検査を理解させるための本として利用価値の高い本である。著者らが指摘するように、「説明と同意に基づく医療」を進めるのに有効な手段となるであろう。

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