

Electromyographic Analysis of Grip

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Introduction

In the 1960-70s, Dr. Long and colleagues used EMG to describe the roles of intrinsic and extrinsic hand muscles in digit motion. Multiple advances have been made in EMG technology and testing. However, we have not revisited the results of these landmark studies.

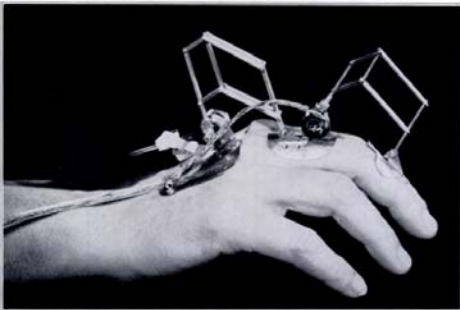


Figure 1. The equipment used by Dr. Long for his studies. (From Long and Brown, JBJS 1964)

Aim

This study used simultaneous, time-locked video and EMG recordings to determine the dynamic use of extrinsic and intrinsic finger flexion during grasp in normal volunteers.

Methods

- (1) Recruited healthy volunteers
- (2) Completed brief questionnaire (handedness, hand function, profession, prior hand trauma or surgery, Quick-DASH)
- (3) Obtained EMG targeting FDP, FDS and intrinsics with time- locked digital video
- (4) Pattern of muscle use during composite fist was determined using video-EMG synchronized data

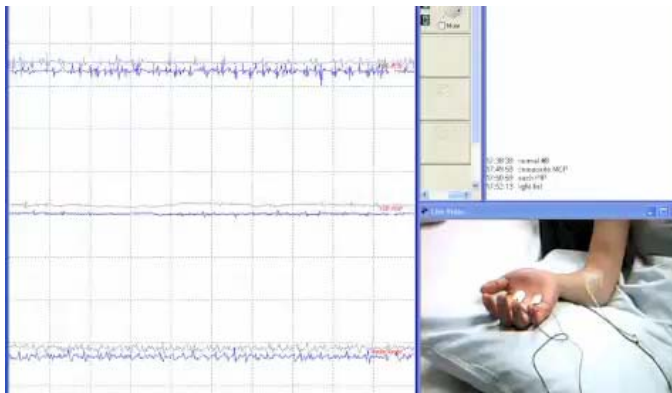


Figure 2. Sample time-locked video and EMG recording. Surface electrodes are seen over the intrinsics with needle electrodes in the FDS and FDP muscles. EMG channels (from top to bottom): FDP, FDS, intrinsics. A light-fist motion is performed, showing initial activation of FDP, with subsequent FDS activation. **(Click video to play)**

Patterns of Muscle Recruitment

	Initiation	Secondary
Light Fist	FDP	FDS OR Intrinsics
Tight Fist	FDP	FDS AND Intrinsics

Conclusions

- (1) FDP is the workhorse in composite fist formation irrespective of effort
- (2) The role of FDS and the intrinsics is less consistent across patients

Future Direction

Analyze recruitment patterns in patients after tendon injury and repair. Patterns and sequences of muscle recruitment could be used to create personalized hand therapy regimens to expedite recovery.